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Exploring learner perceptions of and interaction behaviors using the Research Writing Tutor for research article Introduction section draft analysis

by

Sarah Rebecca Huffman

A dissertation submitted to the graduate faculty

in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Applied Linguistics and Technology

Program of Study Committee:
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Iowa State University
Ames, Iowa
2015

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GLOSSARY OF TERMS

AWE:	Automated Writing Evaluation
CALL:	Computer-Assisted Language Learning
EAP:	English for Academic Purposes
ESP:	English for Specific Purposes
HCI:	Human-Computer Interaction
ICALL:	Intelligent Computer-Assisted Language Learning
L1:	First Language
L2:	Second Language
NNS:	Non-Native Speaker
NS:	Native Speaker
RA:	Research Article
RQ:	Research Question
RWT:	Research Writing Tutor
SFL:	Systemic Functional Linguistics
TL:	Target Language

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ABSTRACT

The swiftly escalating popularity of automated writing evaluation (AWE) software in recent years has compelled much study into its potential for effective pedagogical use (Chen & Cheng, 2008; Cotos, 2011; Warschauer & Ware, 2006). Research on the effectiveness of AWE tools has concentrated primarily on determining learners' achieved output (Warschauer & Ware, 2006) and emphasized the attainment of linguistic goals (Escudier et al., 2011); however, in-process investigations of users' interactions with and perceptions of AWE tools remain sparse (Shute, 2008; Ware, 2011). This dissertation employed a mixed-methods approach to investigate how 11 graduate student language learners interacted with and perceived the Research Writing Tutor (RWT), a web-based AWE tool which provides discourse-oriented, discipline-specific feedback on users' section drafts of empirical research papers. A variety of data was collected and analyzed to capture a multidimensional depiction of learners' first time interactions with the RWT; data comprised learners' pre-task demographic survey responses, screen recordings of students' interactions with the RWT, individual users' interactional reports archived in the RWT database, instructor and researcher observations of students' in-class RWT interactions, stimulated recall transcripts, and post-task survey responses. Descriptive statistics of the Likert-scale response data were calculated, and open-ended survey responses and stimulated recall transcripts were analyzed using open coding discourse analysis techniques or Systemic Functional Linguistic (SFL) *appreciation* resource analysis (Martin & Rose, 2003), prior to triangulating data for certain research questions. Results showed that participants found the RWT to be useful and were positive in their attitudes about helpfulness of the tool in the future if issues in feedback accuracy were improved. However, the participants' also cited wavering trust in the RWT and its automated feedback, seemingly originating from learners' observations of RWT

feedback inaccuracies. Systematized observations of learners' actual and reported RWT interaction behaviors showed both unique and patterned behaviors and strategies for using the RWT for draft revision. The participants' cited learner variables, such as technological background and comfort levels using computers, personality, status as a non-native speaker of English, discipline of study, and preferences for certain forms of feedback, as impacting their experience with the RWT. Findings from this research may help enlighten potential pedagogical uses of AWE programs in the university writing classroom as well as help inform the design of AWE tasks and tools to facilitate individualized learning experiences for enhanced writing development.

CHAPTER 1. INTRODUCTION

Section 1.1. Statement of the Problem

The last fifty years have seen immense advancement in the technological development and pedagogical use of Automated Writing Evaluation (AWE) tools. Pioneering AWE software, initially developed to reduce teachers' workload by automating the scoring of student essays, analyzed the quality of texts by examining language at the surface level (Page, 2003). Contemporary AWE tools, such as *MY Access* (Vantage Learning), *Criterion* (Educational Testing Service) and *Intelligent Essay Assessor* (Pearson Knowledge Technologies), use artificial intelligence technology to conduct more sophisticated analyses of writing features beyond the surface level, such as evaluation of syntactic and lexical features, word choice, grammatical accuracy, and discourse construction.

Although the foundations of AWE underscore its value for summative assessment purposes, some language learning researchers have also pointed to the promise of AWE for formative evaluation of student writing (Cotos, 2011; Shermis & Burstein, 2003; Wang & Xian, 2011; Ware, 2011). Several studies (Chen & Cheng, 2008; Cotos, 2011; Wang & Xian, 2011; Warschauer & Ware, 2006) have explored process-oriented uses for AWE tools in drafting stages of student writing and, while these works have generated an array of practical suggestions for AWE's use in supplementing, as opposed to replacing, formal writing instruction (Chen & Cheng, 2008; Ware, 2011), the investigations have concentrated almost exclusively on student output. It seems that in researchers' focus on *what learners produc*e when using AWE tools for composing written drafts, questions of *how the tools are used* and *what learners think* of the AWE interactions are often neglected. Despite the call to expand learner-centered studies incorporating "in-depth perceptions" and "genuine reactions" to

AWE tools in the writing classroom (Cotos, 2011, p. 444), student-focused behavior and perception-oriented research remains sparse (Shute, 2008; Ware, 2011).

As the use of AWE grows increasingly popular in post-secondary education, becoming aware of the complexities involved in learners' experience with AWE software becomes a matter of immediate and pressing importance. Academic institutions' dwindling monetary resources, the need for immediate feedback for students, and the desire to ease writing instructors' duties are all contributing factors propelling the growing appeal of AWE in university writing instruction (Denton, Madden, Roberts, & Rowe, 2008; Haswell, 2006; Li, 2002; Warschauer & Ware, 2006). Yet the stakeholders – researchers, teachers, and institution administrators – still lack fundamental knowledge about how AWE tools can be effectively used to promote academic writing development. Understanding how learners interact with AWE software and how they perceive these interactions are critical to generating accurate and comprehensive descriptions of both current and potential uses for automated writing evaluation tools in the language learning classroom.

Section 1.2. Purpose of the Current Study

The current dissertation research aimed to carefully investigate learners' experience with the Research Writing Tutor (the RWT), a developing AWE tool which gives users discourse-oriented, discipline-specific feedback on section drafts of their empirical research papers. The intent of this dissertation was to move beyond the evaluation of an AWE program and its feedback, past assessment of student drafts produced through AWE interactions, and into a less explored user behavior and user experience-oriented realm of investigation. Specifically, this study examined in detail students' perceptions of and behaviors during an individual, in-class analysis of their written research article Introduction section drafts using the RWT. A mixed-methods research design was employed to answer questions about learners' perceived usefulness of and trust in the RWT, the degree of control learners believe they have in their RWT interactions, the interaction behaviors and strategies learners use during the draft analysis, and the role of individual learner variables in the CALL interactions.

The current dissertation represents an extension of work conducted for a pilot study examining how language learners interact with and perceive the effectiveness of the RWT. In the pilot study nine students (seven NNSs and two NSs) enrolled in a graduate-level course on academic research writing submitted drafts of Introduction sections to the RWT for analysis and feedback. Screen recordings of students' interactions with the RWT, stimulated recall transcripts, quantitative and qualitative survey responses, and usability data were analyzed to capture a multidimensional depiction of students' experience with the RWT. Findings from the pilot revealed that, despite the developing tool's inaccuracies, students were optimistic about the potential usefulness of the RWT and willing to contribute valuable suggestions for how to improve the tool. Results also showed the learners' tendency to compare AWE feedback to human feedback, potentially deriving from their skepticism about automated systems.

This dissertation work matures from the pilot study in a number of ways. First, this work addresses issues relevant to understanding students' perceptions of their RWT interactions, issues previously unexplored in the pilot. One unaddressed issue from the pilot regards learner control, or the extent of control learners can exert in an instructional situation (Heift, 2002). Because how much control learners feel they can exercise in CALL environments impacts their perceived ability to self-regulate their learning experience (Nix & Wylie, 2011), this dissertation integrates an important research question about the degree of perceived control learners feel in their RWT interactions.

Another key difference between the pilot and this dissertation study is the consideration of learner variables. Though researchers (Cooper, 2004; Gouli, Kyparisia, Papanikolaou, & Grigoriadou, 2005) have called for deeper investigation of individual learner characteristics to better understand learner interactions with CALL programs, the pilot failed to elicit learner data beyond the name and NNS or NS status of the participant. In this dissertation, detailed information about learner demographics, learning preferences and styles, background experiences with technology and CALL tools as well as learner perceptions of the impact of these variables, was gathered to establish a baseline of learners' past experience with CALL and AWE systems, and to more appropriately investigate the potential influence of learner variables on their experiences with the RWT.

This dissertation also builds from the findings of the pilot by exploring learners' intentional use of strategies during their RWT draft revisions. Results from the pilot study revealed that learners used varied, but patterned behaviors when interacting with the RWT. This study springboards from the pilot's findings on patterned behaviors by specifically inquiring about learners' conscious use of strategies when using the RWT for Introduction section draft revision.

A final way in which this dissertation expands from the pilot study concerns the state of the Research Writing Tutor itself. During data collection for the pilot study, the RWT analyzer was unable to identify Introduction section moves and steps with reasonable accuracy. Since that time, the RWT developers have implemented two major changes to the tool. The RWT analyzer's ability to determine move and steps has been greatly improved and a concordancing tool, allowing users to explore how moves and steps are realized in published articles in their disciplines, has been added to the RWT. These developments warrant new investigation of students' interaction with and perceptions of the most recent and improved version of the Research Writing Tutor.

Section 1.3. Theoretical Orientation

This empirical exploration of language learners' perceptions and use of the RWT was supported by the adoption of theoretical underpinnings deriving from multidimensional approaches to language learning. Three perspectives on language instruction, the social constructivist perspective, the Systemic Functional Linguistic (SFL) perspective, and the interactionist perspective, formed the theoretical framework for the study as well as furnished a breadth of views on which to interpret the study's findings. The social constructivist approach enlightened the RWT users not as disconnected individual writers, but instead as interactive members of a community of scholars in their discipline constructing messages in written form to participate in these discourse communities (van Zyl, 1993). The SFL perspective offered insights concerning the processes by which the study participants were socialized into the research article genre by actively participating in the genre in creating and revising their research article (RA) section drafts with the RWT (Halliday, 1989). Finally, the interactionist view elucidated descriptions of how the language learners used the RWT to challenge their knowledge of academic writing and make revisions to their texts based on this new information (Long, 1996). Used in combination, these approaches highlight the complex process the RWT users, novice writers, engage in as they grow, test assumptions about, and apply knowledge of research genre conventions in producing discourse for their disciplinary communities.

In addition to offering substantial theoretical backing for this research, the systemic functional approach further provided critical perspectives for data analyses in answering some of the research questions this the study. The SFL approach to language, which envisions language as content and as a resource for meaning making (Halliday, 1994; Mohan, 1986), provides analytical tools helpful in highlighting the nuances of language and meaning construction, subtleties which traditional discourse analyses may perhaps neglect. SFL researchers, who perceive the text as a whole and as situated within the context of a social practice, use contextualized texts, as opposed to sentences, as the basic units of analysis (Halliday & Martin, 1993). Functional explorations of context begin fundamentally with a conceptualization of register as the lexical and grammatical choices which construe specific contexts of situation (Halliday, 1978). A quote from Halliday (1994) encapsulates a central rationale for use of SFL in analyzing discourse:

> A discourse analysis that is not based on grammar is not an analysis at all, but simply a running commentary on a text: either an appeal has to be made to some set of non-linguistic conventions, or to some linguistic features that are trivial enough to be accessible without a grammar, like the number of words per sentence (and even the objectivity of these is often illusory); or else the exercise remains a private one in which one explanation is as good or as bad as another. A text is a semantic unit, not a grammatical one. But meanings are realized through wordings; and without a theory of wordings—that is, a grammar—there is no way of making explicit one's interpretation of the meaning of the text. (pp. xvi-xvii)

Because a major objective of this dissertation was to better understand language learners' perceptions of the RWT during their first time use of the AWE program, it was imperative that analyses of learners' responses regarding their RWT experience be evaluated in a way that uncovered shades of meaning in the participant discourse. Applying SFL analytic techniques in the data analysis afforded systematic means of deeply exploring the research questions, delving into the learners' perceptions of the RWT as the participants' evaluations were lexicogrammatically realized, and therefore, allowing access to a more profound level of the learner perception data that a traditional analysis of learner discourse would not have afforded.

Section 1.4. Significance of Study

This research carries pedagogical and technological design implications of both immediate and broader significance. Of immediate significance are the recommendations this study's findings make in helping improve the design and functionality of the Research Writing Tutor. This work's results will alert the RWT design and development team to difficulties learners face when using the AWE tool, so the issues may be appropriately addressed for enhanced usability. For example, it is important that the designers know if the analyzer's feedback should be clarified for better learner comprehension or if the user interface should be altered for improved ease of access to the RWT features. By highlighting potential obstacles users encounter when interacting with the RWT, this study provides valuable insights into future modifications to the RWT to ensure is it user friendly and provides understandable, helpful, and accessible feedback for making written RA section draft revisions.

Beyond the Research Writing Tutor, findings from this research may also help to inform the design of AWE software or CALL applications as a whole. In other words, the same type of information useful for improving the RWT could generate beneficial feedback for those designing or updating similar automated systems, building online language learning sites, or creating curricula for CALL environments. Awareness of students' interactions with and reactions to AWE and CALL resources facilitates enhanced recognition of how language learners access and exploit computer-based tools and illuminates ways in which the tools and automated feedback can be adjusted to suit the needs of individual learners.

Lastly, this study is significant in that it aims to fill a glaring gap in past language learning research on the pedagogical use of AWE software. A review of prior research on AWE in the writing classroom shows an overemphasis on student achievement and the accuracy of the automated feedback, as opposed to attention towards students' actual behaviors in AWE interactions or students' perceptions of their experience with AWE applications. An important distinction between this dissertation and previous research objectives (Cotos, 2011; Wang & Xian, 2011; Warschauer & Ware, 2006) is that this study focuses on students' perceptions of and interactions with the RWT and its feedback, not on the quality of the feedback itself or the impact of the feedback on learners' writing development. Thus, this study attempts to close the gap in AWE research by accessing users' insights about their experience with AWE software and raising valuable questions about the nature of learner interactions with AWE tools for writing development.

Note to the Reader

Portions of this dissertation elaborate on data analyses and report results in great detail. For readers not interested in the intricacies of the research question responses or finite detail outlining how findings were obtained, sections have been added to the current work to help the reader efficiently navigate the research project while still maintaining a firm understanding of the research objectives, the means of addressing the research questions, the principal findings revealed by the data analyses, and the important implications of the findings.

In addition to reading the Abstract, Introduction (Chapter 1), and Conclusion (Chapter 7), it is recommended that the reader also pay particular attention to the executive summaries located at the start of each section in the Results and Discussion chapters (Chapters 4, 5, and 6) as well as the summaries of findings located at the end of each of these chapters. These sections highlight the major findings from analyses conducted to answer the research questions investigated and underscore the primary meaning of the findings.

CHAPTER 2. LITERATURE REVIEW

The present study aims to develop a more profound understanding of learners' experience with the Research Writing Tutor (RWT). In order to situate the current work against a backdrop of what has been accomplished thus far in the field and to capture a clearer picture of the current state of the art in AWE research, this chapter addresses theory, research findings, and issues relevant to the use, pedagogical application, and perceptions of automated systems in the L2 writing classroom. First, main tenets of the three primary approaches to genre as well as how the approaches are applied in academic writing instruction are explored to gain a better sense of traditions in genre instruction. Second, the specific theoretical framework underpinning the study is expounded. Next, I take stock of what it means, and has meant, for second language researchers to evaluate the "effectiveness" of AWE programs. I then explore user behavior research in AWE, bringing to the discussion useful concepts and findings from human–computer interaction (HCI) studies. Finally, issues surrounding the impact of individual learner variables, such as learners' individual motivations, learning styles, and technological expertise, are reviewed.

Section 2.1. Approaches to the Conceptualization and Instruction of Genre

Throughout the literature, researchers, theorists, and practitioners call upon three major theoretical perspectives to guide thought, analysis, and teaching of the academic genre: New Rhetoric, English for Specific Purposes, and Systemic Functional Linguistics. Rather than being exploited singularly by advocates of genre-based pedagogy, these three approaches are recognized as providing overlapping frameworks for research and practice in the instruction of academic discourse (Hyland, 2003; Hyon, 1996). From these theoretical schools emerge rich genre scholarship and a broad assortment of suggestions for pedagogical application of genre for academic writing. This section outlines how each theoretical perspective views genre and its construction, specifically calling attention to how each perspective conceives of student involvement in the learning of a genre. The section also underscores what each perspective offers to the instruction of academic writing, of particular relevance to this study that explores how learners use a computer-based tool to learn the academic genre. Lastly, the section addresses where the perspectives diverge and converge, and stresses how these three theoretical foundations can be, and often are, adopted together for common pedagogic purposes. The intent of this examination is not only to inform readers of the principles of the three approaches and identify provisions in their application, but moreover, to furnish a critical conceptualization of the merged view of genre drawn upon in the conception of the Research Writing Tutor (described in detail in the Materials section in Chapter 3).

New Rhetoric Approach

New Rhetoric theory, sometimes termed New Literacy or North American New Rhetoric (Hyon, 1996), stresses the social purposes that are accomplished by genre in situated contexts (Bazerman, 1994; Freedman & Medway, 1994). The theory descends from post-structuralist thought which acknowledges the power of discourse in shaping how we perceive and experience reality. Genre, according to New Rhetoric theorists, is a dynamic social action that involves writers engaging in continual practices of discourse construction and reception. Because the texts we produce are impacted by their interconnectedness with other texts and embedded in social and cultural contexts (a notion termed *intertextuality),* writing is seen as indicative of wider social practices *(*Barton & Hamilton, 1998).

Traditionally, the New Rhetoric School has been most interested in studying first language (L1) composition and academic and professional writing. Genre analyses target the discernment of functional relationships between a text and the rhetorical situation for which it is composed (Coe, 2002; Hyon, 1996). New Rhetoric analyses prioritize examinations of rhetorical context over the textual features of the discourse. The theory's advocates view investigations of blatant surface features of discourse as uncomplicated, simplistic, and inadequate for developing an essential understanding of the text's overall function in a sociocultural context. To combat micro-oriented views of genre, New Rhetoric researchers use ethnographic methodologies such as participant observation or in-depth interviews, as opposed to linguistic and structural methods, to analyze texts and those who produce them (Freedman & Medway, 1994).

When applying this sociocultural view of language to genre-based academic writing instruction, the New Rhetoric approach affords researchers and instructors a profound consideration of the social context of academic discourse (Bazerman, 1988). It allows for scholars to better comprehend the institutional contexts of writing in academic genres and the role these genres play in social environments. Bazerman maintains that it is not enough for teachers to simply provide students with "the formal trappings of the genres they need to work in" (p. 320). Instead writers must learn about and understand the texts' social environments so they may choose the rhetoric most suitable for specific writing situations. Thus, the learning of the genre, its context, and its role precedes the enactment of the genre in New Rhetoric-based instruction of academic writing.

English for Specific Purposes Approach

The English for Specific Purposes, or ESP, approach to genre is more linguistic in orientation than the New Rhetoric theory. ESP conceives of genre as "structured communicative events engaged in by specific discourse communities whose members share broad communicative purposes'' (Swales, 1990, p 45). These communicative purposes are used by the discourse communities to achieve commonly recognized social goals, and they influence how genres are structured and what stylistic and linguistic choices are available to authors (Johns, 1997).

Similar to New Rhetoric, ESP emphasizes the sociocultural aspects of genre and the broader contexts of language use and purpose. Unlike New Rhetoric, however, ESP is concerned with the linguistic variability of texts used in specialized environments and uses linguistic and rhetorical methods for analyzing texts. Also unique to ESP is its explicit focus on pedagogy, especially second language (L2) writing instruction. Though genre can be exploited for text analysis, it is also a means to teach non-native speakers (NNSs) the conventions of writing in particular settings (Bhatia, 1993, 2002; Dudley-Evans, 2000; Flowerdew, 1993, 2005; Gosden, 1992; Hopkins & Dudley-Evans, 1988; Swales, 1990). Writing instruction grounded in ESP for English for Academic Purposes (EAP) stresses the direct teaching of genre to provide learners with real world opportunities to gain conceptual understanding of writing tasks both in and out of the composition classroom (Johns, 2003).

The ESP perspective offers a great deal to the instruction of genre-based academic writing. Among the main advantages of employing this pedagogical approach is the central focus it places on the student. ESP-based teaching aims to engage students in realizing the social aspects of discourse, how texts fit into larger discourse communities, and in identifying the linguistic features used in specialized genres (Dudley-Evans, 2000). Because ESP teachers endeavor to have writers adopt critical perspectives for analyzing and interpreting the genres they must produce, a main goal of ESP genre-based pedagogy is student engagement with texts. ESP proponents argue that learning to write in an academic genre requires students to both understand genre conventions and apply that knowledge to their own writing; therefore, classes are highly interactive and geared towards accommodating students' needs so they may transition from simply understanding the genre conventions to being able to use them appropriately.

Systemic Functional Linguistic Approach

A third perspective for genre-based writing instruction derives from Halliday's (1978, 1994) Systemic Functional Linguistics (SFL) theory of language learning, which perceives language as content and as a resource for meaning making (Halliday, 1994; Mohan, 1986). The SFL approach, often called Australian systemic functional linguistics (Hyon, 1996), the Sydney School (Freedman & Medway, 1994; Johns, 2002) or the functional approach, centers on the intentional, interactive, and structural qualities of genres and the ways language systematically relates to context via lexicogrammar and rhetorical functions. According to functional linguists, language forms are affected by key components of the surrounding sociocultural environment, what Halliday (1978) terms *field* (the activity going on), *tenor* (the relationships among participants), and *mode* (the means of communication) (Halliday & Hasan, 1989). Field, tenor, and mode working together establish the register of language (Halliday, 1978; Halliday & Hasan, 1989).

SFL-based studies of genre analyze contextualized texts, as opposed to sentence-level target language (TL) forms, and submit that texts are acceptable and informative units of analysis (Halliday & Martin, 1993). Because language's schematic structure is a "staged, step-by-step organization of the genre" (Eggins, 1994, p. 36), SFL analysts commonly describe the construct of genre in terms of both its schematic structure and linguistic components, such as cohesive devices, syntax, lexical content and references.

Much like ESP, SFL offers L2 writing instructors helpful parameters for the explicit teaching of generic features in EAP contexts. A specific benefit to learners of academic discourse from SFL concerns the idea of socializing students into a genre by the practice of *doing*. L2 learners being socialized into the practice of *doing* (engaging in, creating, negotiating) the discourse is the most natural method of learning, according to Dewey (1966). Furthermore, because functional linguists see language learning as a continuous process that involves the extension of learners' meaning making potential within widening contexts of use and practice (Derewianka, 1999), the learning of a genre, academic or other, necessitates continual reexamination of those contexts. SFL instructors then aim to help students develop a wide range of skills for genre analysis based on the contexts in which they will be used.

There are, without a doubt, considerable differences in how these three perspectives approach genre-based writing instruction. Some of these differences originate in how the theories perceive the role of genre. For example, the New Rhetoric scholars focus more on the social roles that genres fulfill in certain situations and seek to describe those rhetorical, situational contexts (Bazerman,1994; Devitt, 1993; Freedman & Medway, 1994; Miller, 1994). ESP focuses on the linguistic and rhetorical features of genres with the overall intention of gleaning a better understanding of how to teach genre conventions (Dudley-Evans, 2000). SFL, viewing language as a tool for meaning making instead of principally a goal, examines genres as linguistic processes which combine to form whole texts (Halliday, 1994; Mohan, 1986). The approaches' bases in theory also diverge. ESP is not founded in a specific theory like SFL and New Rhetoric, but rather draws upon a variety of pedagogies and linguistic theories. SFL, by contrast, is both theoretically sound and pedagogically advanced, and is oriented towards the development of language and literacy. New Rhetoric is principally theoretical and has less concern about generating pedagogical recommendations for writing instructors. In general both SFL and ESP advocates emphasize L2 academic writing instruction through learning about language features and functions of the genre, whereas pedagogical applications are of less interest to New Rhetoric scholars. The primary contexts of genre study also vary. New Rhetoric analysts commonly undertake academic and professional writing studies in L1 contexts, whereas ESP and SFL researchers target L2 contexts of language learning. The approaches also use different means to analyze genre. New Rhetoric proponents adopt ethnographic methods for studying the sociocultural elements of genres, whereas ESP and SFL researchers use linguistic and rhetorical methods to analyze texts.

Despite the noted differences in these theories' conceptualizations and treatment of genre, it should be emphasized that these approaches do share some underlying beliefs about genre instruction that are not contradictory and are often paired with one another in research and practice. One important similarity shared by all the approaches is an assumption that genre is dialogic, and constituting producers and consumers, authors and audiences. Additionally, all the perspectives acknowledge the importance of social environment in language creation; they all agree that texts are used in specialized environments which reflect the variability of a text's linguistic characteristics (Berkenkotter & Huckin, 1995). ESP and SFL especially share a number of likenesses, such as an emphasis on texts' meaning as an integral, if not the most important, component in text production. Both ESP and SFL perspectives see genre as relationships between a conventional structuring of textual content and the text's linguistic features (Bruce, 2008), and both aim to provide instructors with parameters for explicit instruction of generic features in EAP contexts. Perhaps most importantly, the perspectives jointly share the elemental objective of helping learners develop skills that will allow them to effectively communicate in academic situations. Because, as Hyland (2003) asserts, "it is hazardous to speak of process as a single approach to teaching since, like genre, it is a term which embraces a range of orientations and practices" (p. 18), it may be beneficial to see these three perspectives on genre-based writing instruction as complementary. Seeing the perspectives for how they can be blended may offer greater insight into the multifaceted nature of genre and greater awareness of how best to acquaint students with the genre of academic writing. A view that merges these perspectives is also germane to understanding the theory founding the creation of Research Writing Tutor, the key tool under investigation in this dissertation.

RWT Integration of Genre Approaches

The Research Writing Tutor, the AWE tool under investigation in this dissertation study, adopts a merged view of these three perspectives on genre in both its conceptualization and functioning (Cotos, 2009). Firstly, the automated feedback the RWT provides to users is very much based on the text's interconnectedness with other published research in the student's discipline, conceptually embedding and analyzing the student's draft within relevant social and cultural contexts and attending to what New Rhetoricians term *intertextuality* (Barton & Hamilton, 1998). Furthermore, the type of genre analysis the RWT conducts on student texts attends to the functional relationships between the provided text and the text's purpose (Coe, 2002; Hyon, 1996); more specifically, the RWT feedback focuses on how effectively the student's written draft achieves the communicative purposes dictated by the text's context and genre of use.

Secondly, the RWT draws on ESP theory by encouraging users to adopt critical perspectives for analyzing, interpreting, and reproducing writing in the RA genre. A primary objective of ESP genre teaching is engaging writers with their written texts; the RWT facilitates deep engagement with texts by prompting students to re-see their section drafts in light of the provided feedback, thus helping students envision how their section drafts adhere to the genre conventions of the larger RA discourse community (Dudley-Evans, 2000); the

RWT then helps students bridge their knowledge of the genre conventions in general to an application of that knowledge for text revision by providing specific suggestions on how to more effectively incorporate moves and steps as they improve their section drafts.

Finally, the SFL perspective's emphasis on the intentional and structural qualities of genres fits closely the RWT's purpose of motivating students to reflect on their rhetorical intentions, and how those intentions connect to their lexicogrammatical choices in language, in their written section drafts. The RWT also absorbs students in a process by which they are becoming socialized into the research article genre by essentially *doing* research discourse (Dewey, 1966); as students interact with the functional feedback provided by the RWT and make revisions to their writing, they are familiarizing themselves with the writing conventions typical of published research in their discipline, thereby socializing themselves into this professional community of practice.

Section 2.2. Theoretical Framework

Because participants in this study are not only users of the RWT, but principally learners, novices endeavoring to develop skills in the research writing genre, it is essential to ground this research in theory appropriate to exploring students' use of the RWT for language learning purposes. The current research employs a combination of two theories of language learning, the social constructivist model and the interactionist approach, that jointly serve as the theoretical basis grounding this dissertation study. Building on the previous section's coverage of genre perspectives, this section delves more deeply into two language learning perspectives pertinent to the current study. After briefly discussing fundamental principles of each language learning theory, the Systemic Functional Linguistics (SFL) perspective, a social constructivist view of language learning which illuminates how learners represent, execute, and validate their social reality (Halliday, 1978) as they *do* disciplinary discourse, is highlighted as a guiding perspective for the current research. Understanding how this study is rooted in established language learning frameworks helps facilitate a conceptualization of potential theoretical and pedagogical implications for the use and development of the RWT and similar computer-assisted language learning (CALL) programs.

Social Constructivist Approach

The social constructivist theory of language learning recognizes language as a social and communicative activity requiring collaborative negotiation of meaning amongst participants in a communicative interaction. The theory is rooted in Lev Vygotsky's (1978) concept of social constructivism, which posits that knowledge is constructed cooperatively by groups of people, producing shared artifacts (both concrete and abstract) with shared meanings. According to the social constructivist view, knowing is an outcome of building and rebuilding meaning; new concepts are learned by connecting previously known concepts with new information (Ku, Bravo, & Garcia, 2004). In such a view, successful communication involves interactants mutually agreeing on the legitimacy of their interpretations of a constructed message (Garner, 1995). In language teaching, social constructivist theorists urge teachers to consider students' previous knowledge and learning contexts when designing language learning environments. As the goal is to grow students' language and cultural competence, the role of the instructor is to model and support meaning-making through collaborative student–student and teacher-student interactions (Flowerdew, 2005).

By applying the social constructivist theory of language learning to genre-based academic writing instruction —of particular relevance to this dissertation study, wherein students are learning how to write in a specific genre, the research article genre —intensified emphasis is placed on the writer not merely as an individual, but also as a part of an interconnected community of disciplinary scholars (van Zyl, 1993). New Rhetoric theory, described in more detail in the preceding section, shares numerous connections to this social constructivist perspective on language learning; these connections largely pertain to New Rhetoricians' view of writing as a social practice, as embedded within specific discourse communities, and the notion that learning an academic genre entails students mastering the discourse conventions particular to a genre through continual participation in the writing for and within students' target academic discourse communities.

Systemic Functional Linguistic Perspective

One language learning perspective that associates strongly with the Vygostkian social constructivist theory of language learning and is of particular importance to this study is the Systemic Functional Linguistic perspective, briefly described in the previous section. In the late 1960s and 1970s, Michael Halliday, father of functional linguistics, extended Vygotsky's social constructivist notions of language to maintain that while language is indeed used to construct reality, it is also built through dialectical interactions between language and community, embodying the notion of language as a social semiotic and a resource for making meaning (Halliday, 1994). Like social constructivists, functional linguists theorize about the relationships among culture, action, ideology, and language, and emphasize the contextualized uses of language in terms of the choices speakers make to convey meaning.

More unique to SFL, however, is its focus on how meaning is realized at the textual (discourse semantics), clausal (lexicogrammar), and phonological levels as well as textual coherence according to the context of cultural (genre) and context of situation (register). Situational context, according to SFL proponents, includes three components that comprise a discourse's register: *field* (what is happening), *tenor* (who is involved), and *mode* (how a text is channeled). Halliday (1978, 1994) further distinguished three kinds of meaning, or *metafunctions*, which are expressed in each clause and relate respectively to the variables of field, tenor and mode: the *ideational* (offering resources for representing our experiences), the *interpersonal* (offering resources to facilitate interactions), and the *textual* (offering resources to create coherent and connected texts). Any situational context is built up by the grammatical choices a language user makes to accomplish each of these metafunctions. (See Figure 2.2-1 for a diagram of SFL's contextualized view of language use).

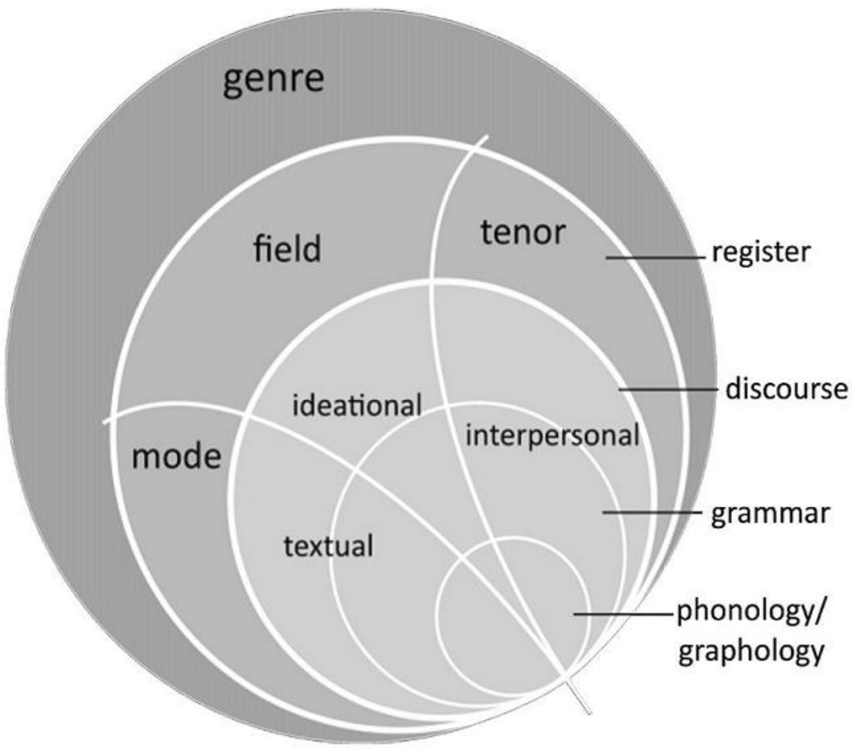


Figure 2.2-1. SFL model of language situated in social contexts (Martin & Rose, 2011)

In terms of students learning to write in a particular genre, a functional perspective to language learning accentuates the socialization of students into a genre by the practice of *doing.* L2 learners being socialized into the practice of *doing* (engaging in, creating, negotiating) the discourse is the most natural method of learning, according to Dewey (1966). Furthermore, because functional linguists see language learning as a continuous process that involves the extension of learners' meaning making potential within widening contexts of use and practice (Derewianka, 1999), the learning of a genre, academic or other, necessitates continual reexamination of those contexts. In other words, learning an academic genre would involve learners, novices to a community of practice, participating in language–mediated activities in those target discourse contexts (Schieffelin & Ochs, 1986). From this socialization standpoint, language learning tasks are understood "no longer...as linguistic training, but as engagement with a cultural practice" (Hanna & de Nooy, 2003, p. 71).

Interactionist Approach

The interactionist approach to second language acquisition is the second theory providing principled footing for the current study. The interactionist theory perceives interaction as the means by which learners obtain the TL input necessary for successful learning. Incorporating principles from Krashen's Input Hypothesis (1985) and Swain's Output Hypothesis (1985), researchers working from interactionist views study the composition and processing of comprehensible input for linguistic development (Long, 1996). The interactionist approach stresses the roles of interaction and feedback in the promotion of cognitive awareness, or the noticing of, attention to, and working memory required for producing appropriate linguistic forms (Chapelle, 1997). A central component of this process is negotiation of meaning, a result of breakdowns in communicative exchanges (Long, 1996).

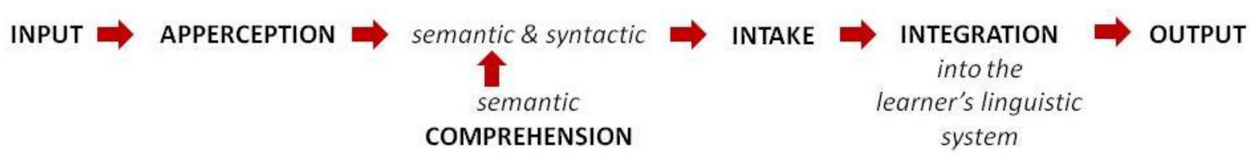


Figure 2.2-2. Interactionist model of language learning (Chapelle, 1998)

Figure 2.2-2 depicts an interactionist conception of the language learning process. In this model, the learner first receives TL input, only some of which is apperceived. Semantic meaning is then comprehended, with or without understanding of the syntax; that which is comprehended becomes the intake. The intake is applied and/or stored in a learner's short-term memory and modified output, the perceptible result of the process, is produced (Chapelle, 1998; Swain, 1985). It is through this process that interlocutors' input forces second language (L2) learners to compare their language with TL input, identify the mismatch between TL input and their own output (Gass & Mackey, 2007), generate new hypotheses about the L2, and construct further modified output.

Grounding the Study

The social constructivist theory, and more precisely, the SFL perspective therein, and the interactionist theory serve as theoretical foundations to the current study as well as bases to the conceptualization of and intended uses for the AWE tool under investigation, the Research Writing Tutor. Regarding this study's exploration of learners' experience with the RWT, a systemic functional approach, which views language learning as a continuous expansion of learners' meaning making potential through contextualized practice (Derewianka, 1999), fits closely with the intended, process-oriented uses of the RWT. In this dissertation, study participants' generic knowledge is scaffolded prior to and during use of the RWT, corresponding to functional linguists' proposal for learner familiarization with a genre through the process of actually *doing* the academic discourse. Even before their draft analysis using the RWT, learners practice discerning the generic structure of research articles in their respective disciplines and considering how the texts fulfill overarching social purposes (Halliday & Martin, 1993). This structural identification involves exploitation of a functional schema devised by Swales (1990, 2004), a chief contributor to work on genre analysis. Specifically, the study participants are first taught Swales' (2004) widely known Create A Research Space (CARS) model for research article Introductions, one which utilizes the concept of *moves,* discoursal building blocks carrying out particular communicative purposes, and *steps,* rhetorical strategies used to accomplish the communicative purposes. The learners then practice recognizing the unfolding of the Swalesian Introduction move/step schema in a corpus of research articles in their disciplines and applying the observed discourse conventions as they construct their own Introduction section drafts. By the time learners participate in self-analysis of their drafts using the RWT, they are well-trained in distinguishing and manipulating the functional moves and steps in Introduction sections. The RWT's automated feedback, also based on Swales' rhetorical move/step schema and generated from a cross analysis of the submitted learner draft and target research articles in the designated discipline, helps learners recognize how the recommended revisions will help them structure their texts and hone their functional language. Thus, a systemic functional perspective on genre threads the entire learning process, from instruction of functional moves to draft composition and revision, making students intimately familiar with the expectations of the genre they aim to reproduce.

Furthermore, systemic functional perspectives provide this study with critical elucidation of the elemental role of context in the language learning process. SFL advocate Gerot (2000) argues that a language learner "will be successful to the extent that she understands the cultural/situational context encapsulated by the text and to the extent that she understands how the language used in the text functions" (p. 206). This study embraces the systemic functional focus on context by examining learners' interactions with and responses to the RWT as the tool helps students perceive the connections between their own texts and the inextricable environments in which they are constructed. For example, as a learner interacts with the RWT, the individualized feedback provided by the tool directs the user's attention to the draft's rhetorical structure by using feedback that is color-coded according to the Swalesian (2004) move/step schema for Introduction sections. Viewing the analyzed, color-coded draft helps the learner observe how the groups of clauses or sentences (rhetorical steps) relate to the overall context (move structuring and distribution) of the section, or what Halliday and Hasan (1976) refer to as *textual coherence*. Accentuation on context is further expanded as the RWT simultaneously contextualizes the student's individual draft analysis within broader analyses of published Introduction sections in the learner's discipline. Visual feedback, in the form of pie charts and range bars showing the target goal for move and step occurrence in Introduction sections in the discipline, permits learners to notice the potential mismatch between move and step distributions in their drafts and those distributions in the larger context of published articles in their fields. Utilizing social constructivist and SFL insights about the situated construction and co-construction of register-specific discourse assists in interpreting learners' experience with the RWT as they become aware of the contextual demands for writing in their respective fields.

Yet another reason why the social constructivist and SFL views of language learning support both the study and the intended uses for the RWT concerns their stress on socialization in the learning process. In a systemic functional socialization model of language learning, learners are acknowledged as active agents situated in a context and culture of mutual influence (Halliday, 1994). According to this socialization view, developing language in a genre requires active participation in the genre (Halliday, 1989); it is precisely this approach to genre learning the current research adopts. Participants in this study develop genre-specific skills through dynamic, RWT-mediated engagement with their own Introduction section drafts and with a body of model texts produced by scholars in their disciplines. By analyzing students' onscreen behaviors during student–RWT interaction, this dissertation explores how learners use the RWT to gain expertise in the social practice of *doing* research writing.

The SFL socialization model is also especially relevant to this study because of the highly social nature of the research article. The research article is a means by which academic discourse communities communicate, exchange ideas, and collaborate (Bizzell, 1982). In the process of identifying how their own texts compare to published texts in their disciplines, RWT users uncover interrelationships between particular discourse features of discipline-specific texts and the communicative social practices they realize. In other words, the learners come to grasp how their writing can meet expectations of their discourse communities by learning, from authentic disciplinary discourse, how members of those communities communicate with one other. The foundation of learners' RWT interaction is, on multiple levels, a social one and benefits tremendously from a functional socialization view of language development.

The interactionist approach to SLA provides further theoretical basis for this study. Because the research questions in this dissertation are principally concerned with learners' interactions with the RWT's automated feedback, an interactionist approach helps explain how learners use the tool to test their assumptions about generic writing and make modifications to their TL output (Long, 1996). Specifically, the interactionist perspective offers a theoretically established means for tracing learners' use of the RWT for language learning by furnishing the relevant concepts of input, interaction, feedback, output, and positive and negative evidence.

According to Long (1996), for the learner to produce the appropriate TL output, the TL input must supply both positive evidence (correct TL forms) and negative evidence (identification of the errors). The TL input given by the RWT feedback supplies both types of evidence: positive evidence in the form of target models, or published research articles showing multiple instances of successful execution of the Introduction move/step schema, and negative evidence in the form of color-coded range bars and pie charts highlighting differences between the goal for functional language use in the discipline and how the current draft measures up in comparison. During their interactions with the TL input, learners are motivated to compare the tool's analysis to their intended rhetorical function for each sentence, detect the deficiencies in their output, and compose more comprehensible output in revised drafts. The modified output learners produce spurs further negotiation of meaning when learners reanalyze their latest revised draft and receive new RWT feedback to confirm or reject their hypotheses about appropriate uses of functional language. By supplying pertinent terminology for discussing how language learners receive, incorporate, and make draft revisions based on the automated feedback, the interactionist approach provides a helpful framework for exploring learners' use of the RWT for language development as an iterative, interactive process.

Also, because a primary objective of this dissertation is to understand how to improve the RWT and similar AWE or CALL tools to enhance learners' linguistic development, the interactionist perspective of SLA may help generate practical suggestions for increasing the comprehensibility of the RWT's automated feedback. The interactionist approach regards the interactional adjustments learners make in negotiating meaning as a means for focusing learners' attention to both the message meaning and language form (Hegelheimer & Chapelle, 2000). Effectual curricula in this SLA perspective incorporate tasks that trigger learners' noticing of problematic features through a comparison of correct language forms and learners' own TL output. Consequently, how focused or explicit the TL feedback is in providing negative evidence will determine the extent to which learners notice, and move to fuse, the gap between their own output and the TL input. Because the current research is interested in how learners access, use, perceive, and apply the RWT's TL feedback on their Introduction section drafts, the interactionist model of language learning will cultivate recognition of how well the automated feedback supplies opportunities for learner engagement in meaning negotiation; moreover, the approach will provide a means of envisioning how RWT input can be adapted so it is composed and delivered in the most understandable, easily accessible format to language learners.

Section 2.3. Investigating the Effectiveness of AWE Tools

Studies examining the use of AWE tools in first or second language learning settings have exploited an assortment of criteria to determine the effectiveness of the computer-based resources in writing instruction. Some have attempted to investigate an AWE program's effectiveness by comparing the reliability of a tool's feedback to feedback provided by human raters (e.g., Phakiti, 2011) or an instructor (e.g., Chen & Cheng, 2008; Hyland & Hyland, 2006). Others (e.g., Chung & Baker, 2003) question the tool's validity and whether it actually measures what it claims to measure. Still others (e.g., Cotos, 2011; Li, 2002; Warschauer & Ware, 2006) consider an AWE program effective in terms of its pedagogical usefulness, that is, when students exhibit evidence of development along the drafts. Whatever the focus of the researcher, it remains clear that determining the effectiveness of AWE tools is not a straightforward endeavor, but rather one which requires reflection on the process and perceptions of the process in the CALL-based drafting stages.

Emphasizing Demonstrated Linguistic Achievement

Existing research aiming to determine the didactic worth of AWE software has overwhelmingly accentuated learners' linguistic gains when interacting with the programs (Escudier, Newton, Cox, & Reynolds, 2011). All that can be confidently deduced from the research is that findings remain contradictory. Investigators report on advantages of AWE use, such as improvement in scores (Attali, 2004; Rock 2007; Foltz, Laham & Landauer 1999), lowered error-rates (Attali, 2004), increased learner motivation and positive attitudes (Cotos, 2012; Grimes & Warschauer, 2010; Schroeder, Grohe & Pogue, 2008), and augmented language learning potential (Cotos, 2011). Compared to delayed written feedback, the immediate automated feedback has been shown to have a sizeable effect on the revisions learners make to their written drafts (Tuzi, 2004). At the same time, there is evidence of no significant improvement in students' writing after using AWE software (Shermis et al., 2004; Warschauer & Grimes 2008) or, when learners showed improvement, the progress was mainly at the surface level of grammar and mechanics (Attali 2004; Rock 2007; Warschauer & Grimes 2008). In Shute's (2008) examination of studies evaluating AWE feedback effectiveness, the researcher found that while much work has been done on the topic, studies on the impact of AWE use remain inconsistent. Shute reasons that the inconsistencies may be a result of a number of variables affecting students' motivation to improve their writing (such as attitudes, independence, intrinsic motivation, metacognitive skills), and recommends that not only the impact of the feedback, but also the function, content, and interactive mode be examined when determining the effectiveness of an AWE tool.

Also, in exclusively second language (L2) learning research, a central focus of the studies has been on students' demonstrated linguistic achievement when using AWE materials. Such research is typically conducted by comparing students' first drafts (written prior to interaction with AWE programs) to subsequent drafts (written post or mid-interaction with AWE program support) to discern the displayed degree of improvement (Attali, 2004). Some study findings on the effects of AWE use in the L2 writing classroom show varying levels of writing achievement as dependent on learners' language proficiency (Chen & Cheng 2008; Yang, 2004). Others have identified explicit benefits and drawbacks to L2 learners' use of AWE software in terms of student output. In a recent study by Wang and Wang (2012) on the influence of the AWE tool Writing RoadmapTM 2.0 (WRM), the researchers found that while the use of WRM improved word choice, fluency, spelling and grammar in L2 learners' writing, the tool was unable to provide sufficient feedback on the organization of the students' essay. Similarly, Grimes and Warschauer (2006) and Yang (2004) claim that AWE feedback has the tendency to be quite formulaic and is unable to provide the individualized feedback necessary for improving L2 learners' advanced academic writing skills; in turn, some second language writing instructors and researchers fear that classroom use of such formulaic feedback may force students to notice surface features more than the meaning of the text, as the generalized automated feedback undermines texts' meaning. Namely, the worry is that AWE's algorithmic preferences for formulaic texts over essays involving elegant, advanced content development (Baron, 2005) may endorse unimaginative and prescribed writing for test-taking purposes (Yang, Buckendahl, & Juszkiewicz, 2002). Though these researchers raise legitimate concerns about both negative and positive impacts of AWE use on student output, investigating demonstrated improvements in drafts alone masks the illuminating ways in which learners interact with AWE tools to achieve their individual learning objectives.

Evaluating AWE Feedback Quality by Human Feedback Comparisons

Among the more popular foci of AWE effectiveness studies are those comparing AWE feedback to that produced by human raters (Hutchison, 2007; Keith, 2003). Though developers of AWE programs often claim their evaluation tools are just as accurate as human raters, there is still a great amount of skepticism about these claims (Ericsson & Haswell, 2006). For this reason, many evaluators of AWE applications (Denton et al., 2008; Li, 2002; Warschauer & Ware, 2006) undertake comparison studies to assess the effectiveness of certain tools in terms of how the tools' output compares to that of human raters. In a study investigating 15 such AWE effectiveness studies published between 1990 and 2008, Phakiti (2011) analyzed both the results of and criteria used for evaluating the reliability of four commercial programs (E-Rater, Intellimetric, Intelligent Essay Assessor, and Project Essay Grading), namely regarding rater agreements and correlations between human scores and computer rater scores. Phakiti found that the average exact agreement (the rate at which compared raters provided the same score to an essay) between AWE programs and human raters was 53.54 percent, compared to 51.00 percent in human-rated scores; the average adjacent agreement (the rate at which compared raters scored less than one score point apart) between AWE programs and human raters was 95.12 percent, compared to 94.13 percent in human-rated scores. Phakiti argues that the statistics are inadequate for claiming good agreement among the essays scored by AWE programs.

However, Chung and Baker (2003) warn that when seemingly high rater reliability among human and AWE scores is reported, the statistics should be interpreted with care. Strong reliability indicators are still an "insufficient condition for validity" (p. 29), the authors caution. Consequently, validity studies, in addition to reliability comparison studies, are necessary to better understand in actuality *what* is being scored (Keith, 2003; Weir, 2005).

Like previously noted AWE effectiveness studies, comparison studies have also evaluated the differences in students' writing achievement having received human or automated feedback in drafting stages. In a study comparing the impact of AWE feedback versus instructor feedback on students' writing, Chen and Cheng (2008) sought to answer questions about whether teachers can be replaced by technology and whether technology should be used instead of teachers' instruction in certain tasks. While the authors found no simple answer to their research questions, they acknowledge that multiple individual factors (motivation, goal, proficiency level) as well as instructor factors, must be considered when assessing the effectiveness of AWE tools and their use in the classroom. The authors state overtly that AWE programs cannot replace teachers, but could surely be useful in providing supplementary feedback for students to revise their papers.

Understanding Pedagogical Applications of AWE for Formative Purposes

For what purposes AWE feedback is used by students or instructors carries much consequence in writing instruction and evaluation. Ware (2011) insists an essential designation be made between computer-generated *feedback* and computer-generated *scoring*. The latter references automated scores drawn from mathematical models that account for syntactic, mechanical, and organizational writing features (Chung & Baker, 2003). Alternatively, computer-generated feedback, what is given by the Research Writing Tutor studied in this research, denotes a tool's ability to assist, not assess, student writing (Ware, 2011). Such a distinction can similarly be conceived through the notion of formative evaluation or assessment, which facilitates, rather than measures, learning "as it focuses on the gap between the present performance and the desired goals" (Chen & Cheng, 2008, p. 97).

A number of language learning researchers (Cotos, 2011; Hyland, 2003; Myers, 2003; Shermis & Burstein, 2003) back the pedagogical application of AWE feedback for formative, as opposed to summative, assessment purposes. Myers (2003), Cotos (2011), and Hyland (2003) maintain that, when used in combination with instructor assistance, automated feedback facilitates in-process support which helps students develop strategies for recognizing their writing's strengths and weaknesses. Thus, intensified and prolonged use of AWE tools in the classroom may be one means of helping students identify the discrepancy between their current state of writing and the goal they wish to attain, and help them more clearly envision their objective (Lee, Gentile, & Kantor, 2010; Shermis & Burstein, 2003).

Research on AWE for formative purposes has also raised questions about how a tool aids students' noticing of particular features of their writing. Cotos (2011) investigated the potential for an AWE program called Intelligent Academic Discourse Evaluator (IADE), specifically considering if the program's automated feedback prompted learners' focus on discourse forms or cultivated students' self-reflection on writing for improvement. Through analyses of learners' reported thoughts and actions during their interaction with IADE and the actual IADE scores, Cotos found evidence that IADE sparked learners to pay attention to the discourse forms, which led to enhanced rhetorical quality of learners' writing, and concluded that automated feedback may hold the potential to foster writing development, especially when applied strategically in specialized contexts. Understanding the characteristics unique to a specific learning context may help instructors further determine "in what ways a particular CALL task is appropriate for particular learners at a given time" (Chapelle, 2001, p. 53), therefore enabling instructors to select and implement more learner-focused materials and curricula.

Uses of AWE feedback for formative assessment have likewise been explored in terms of how automated systems promote enhanced learner autonomy, what Benson (2001) identifies as a "precondition for effective learning" (p. 1). The development of autonomous learning strategies demands that learners be accountable for their own learning, establish their individual learning goals, choose suitable resources and ways of exploiting them, and evaluate their own progress (Cotterall, 2000). Warschauer and Grimes (2008) report that use of the AWE software *MyAccess* in drafting stages of the writing process allowed learners to work autonomously, processing the diagnostic feedback and attending to revisions at a comfortable and self-determined pace. For instance, whereas faster writers are prone to complete an in-class task and wait idly for the class to wrap up, use of the AWE program incited these writers to engage in continual submission, revision and resubmission of drafts. In the same way, slower writers were able to move at their own suitable paces for interpreting and incorporating the AWE feedback.

A consequent perk to the pedagogic process is the positive impact autonomous learning has on teachers' in-class time management. In Warschauer and Grimes (2008), teachers cited an enormous plus to using *MyAccess* was that it immersed students in autonomous tasks, thereby freeing up instructors' time to work individually with students who sought extra help. In addition to permitting teachers time for more individualized learner instruction, incorporating AWE programs in drafting stages has also been shown to facilitate easier classroom management. One teacher in Warschauer and Grimes' study remarked that the AWE tool served as "a second pair of eyes" to watch over the classroom. Participating instructors in other studies conducted by the same authors (Grimes, 2008; Grimes & Warschauer, 2008; Grimes &Warschauer, 2010) also reported they had both more time to devote to instruction of individual students and experienced easier management of classroom time and activities.

Similar research by Chen and Cheng (2008) uncovered that instructors who are flexible in how and when they require students to use AWE software spur students to raise their own awareness of linguistic conventions and mechanics. Sustained and repeated individual interactions with the automated diagnostic feedback force learners to become conscious of their habitual grammatical and syntactic errors. Further improvement of mechanical and syntactic issues occurs when learners seek assistance from the AWE program's built-in writing tools as opposed to relying on error correction from the writing instructor (Warschauer & Grimes, 2008). Supplemental, built-in language learning resources, such as dictionaries, thesauri, editing tools, and sample essays, enable learners to self-direct their learning experiences, and develop self-reliance as they develop their academic writing.

In CALL as a whole, learner autonomy has been extensively studied with the intention of improving the effective and appropriate design of software for individualized learning experiences. CALL technologies are commonly endorsed for their ability to facilitate increased learner interaction and, therein, more possibilities for learners to regulate how they learn (Blin, 2004; Figura & Jarvis, 2007; Warschauer et al, 1996). Still, Levy and Stockwell (2006) assert that learner autonomy should not be considered invariable, but instead be viewed as contingent on the language learning activity, the technology, and the students' intrinsic motivation. Chappelle (2008) argues that CALL materials should always attempt to facilitate autonomous learning and strive to adapt to changing learner needs. The challenge is figuring out how to develop learners' strategies to they may continue to make use of the language learning resources on their own. Iles (2012) suggests the incorporation of tasks and activities that give learners extended practice working with the computer-based applications on their own terms will help students cultivate such autonomous learning strategies.

The use of corpora in the writing classroom has also been noted to stimulate autonomous learning. In a corpus study by Yoon (2008), students took more responsibility for their L2 language learning as a result of using corpora in the drafting stages of writing. Yoon states that through students' interactions with authentic texts in the corpus, language learners were able to solve language problems, such as syntax, grammar, and coherence, on their own. The author recommends the inclusion of corpus searches that are student–led to supplement traditional classroom writing instruction in order to raise learners' linguistic awareness through problem-solving and, simultaneously, encourage autonomous learning. Corpus-oriented research on autonomy is of special relevance to this study, because the RWT permits learners to access a corpus of published articles in their respective disciplines; learners in this dissertation study will be using this corpus, one which has been annotated according to the Swalesian move/step schema for Introduction sections to research articles, to retrieve examples of rhetorical moves and steps realized in authentic, published research. Research on the use of corpora for promoting learner autonomy may expose potential ways RWT users could use the concordancing tool to increase self-sufficiency as they develop research article writing skills.

Considering Learner Perceptions of AWE

Though many researchers recognize the need to examine how learners value AWE-generated feedback in helping their writing development (Calvo & Ellis, 2011; Chang & Tung, 2008; Davis, Bagozzi & Warshaw, 1989; Lai, 2010; Tsai, 2004, 2007), studies investigating student–AWE tool interactions as the students, or users, perceive them are markedly less common in language learning research. Likewise, few researchers have investigated students' evaluations of the AWE tool itself. The majority of learner perception research is confined to investigations of learner preferences for AWE versus human feedback. Non-comparison studies have, not surprisingly, discovered that AWE users acknowledge the value of an AWE program in terms of the program's usefulness (Chen & Cheng, 2008; McNamara, Crossley, & McCarthy, 2010), how much they can trust the AWE feedback for making revisions to their written drafts (Chang & Tung, 2008; Scharber, Dexter, & Riedel, 2008), and the degree of control learners have in their computer-based interactions with the AWE feedback (Cotos, 2010; Heift, 2002, Wang & Xian, 2011), all practical aspects relevant to the draft revision process. Because knowing AWE users' perceptions of the feedback they receive is critical to understanding how learners form their opinions about, and behaviors in, English writing (Haswell, 2006; Leydens, 2008; Shute, 2008), L2 research would benefit from accessing more learner perceptions of AWE feedback as well as users' interactions with AWE software.

In general, studies incorporating learner perceptions of AWE tools are pooled around comparisons of AWE feedback to feedback from human readers, such as instructors or peers. Most research has observed learner preferences for instructor feedback, and a willingness to consider AWE feedback written drafts in addition to instructor feedback. For instance, in a study by Hyland and Hyland (2006), it was found that learners not only value their instructors' feedback over AWE feedback, but also apply the instructor's feedback to make more accurate revisions in subsequent drafts. Research by Yang (2004) echoes Hyland and Hyland's findings, revealing that L2 learners showed less favorable reactions toward the AWE feedback compared to instructor-provided feedback. Yang suggests it may be an expectation for more meaning-focused feedback, as opposed to the form-focused feedback typically provided by AWE programs, which leads students to prefer their instructor's feedback.

Studies comparing learner perceptions of automated feedback to peer feedback (e.g., Lai, 2010; Long 1984; Storch, 2005; Warschauer & Ware, 2006) mirror the AWE versus instructor feedback research findings. In a comparison of Taiwanese ELLs' perceptions of peer feedback versus feedback provided by the AWE tool *My Access,* Lai (2010) found that learners preferred peer feedback to the automated feedback. The author cites contextual factors, such as the impact of social learning, feedback strategies, computer anxiety, and cultural impact, as influencing the learners' preferences for peer feedback. In a similarly designed study by Calvo and Ellis (2011), the researchers compared engineering graduate students' perceptions of feedback provided by an AWE system called *Glosser* to human tutor feedback. However, data from interviews with students who used *Glosser* and those assisted by human tutors showed that students' impressions of human and automated feedback were similar. The researchers reason that, ultimately, how students perceive automated or human feedback depends less on the source and more on the type of learners the students are. The students Calvo and Ellis classified as *deep learners*, for example, perceived feedback as a way to improve their knowledge about a topic. *Shallow learners* saw feedback more as a means to develop the communicative parts of writing, especially surface features like grammatical conventions and spelling. That is to say, students' personal plans for using the feedback had the most impact on learner opinions.

Learner studies on the incorporation of AWE tools in specific classroom contexts have found that when teacher or peer feedback is substituted by automated feedback, students express dissatisfaction (Chen & Cheng, 2008). On the other hand, when AWE feedback is included as a step in the already existing social writing process, in which students receive AWE feedback as an additional resource to peer or teacher feedback, students respond more favorably to the AWE feedback (Grimes & Warschauer, 2010). In their longitudinal study of how the automated writing scoring program *MyAccess* supports student draft revisions, Grimes and Warschauer (2010) found that use of the tool simplified the organization of the classroom and heightened students' motivation to revise their drafts. The authors conjecture this positive impact resulted because the instantaneous feedback provided by the AWE tool, be it via numerical and/or rubric-based scoring or feedback on mechanical issues, encourages self-motivated and autonomous revisions. Such human-plus-automated feedback combinations also double the amount of feedback students receive on a draft, thus likely contributing to greater student satisfaction with the two forms together.

The limitations learners notice in AWE feedback may be another variable potentially influencing learner preferences for human feedback. Chen and Cheng (2008) hold that students acknowledge many of the same limitations that L2 learning researchers recognize with AWE feedback, such as the systems' exaggerated preferences for longer texts and higher numbers of transition words, the inability to recognize more subtle logic or content development and the discouragement of nontraditional and creative essay construction. In that same study, Chen and Cheng observe that students who receive feedback from instructors *and* AWE software were able to more readily identify the limitations of both types of feedback regarding how well the feedback assisted their writing development. It seems that exposure to different feedback forms promoted the capacity for students to engage in critique of the sources' shortcomings and assets.

Beyond the studies comparing automated feedback to that provided by humans, learner perceptions of a tool's usefulness, the extent to which learners trust a tool, and how much control users have in the CALL interactions are among the habitually cited concerns for students surveying the value of an AWE program. To be expected, how useful an AWE program is in assisting students' writing development is a leading factor impacting learners' perceptions of an AWE tool's effectiveness. In a study by Fang (2010) gauging EFL learners' perceptions of the AWE program *MyAccess*, the investigator observed favorable attitudes towards the tool as connected to learners' responses about the usefulness of the tool and projected usefulness for L2 students studying in similar college composition environments. In another study on L2 learners' classroom use of automated feedback, Ware (2011) found that students in the treatment group (who used automated feedback for 90 minutes over the course of a six-week period) not only made significant gains in their writing scores from the start to finish of the study period, but also maintained enthusiasm about the software throughout the study. That positive perceptions of the AWE tool only improved with prolonged use may be resultant of students' continued recognition of the usefulness of AWE feedback, Ware reasons.

How useful learners perceive AWE software may resultantly influence learners' acceptance of new technology. The Technology Acceptance Model (Davis, 1989), founded in information systems theory, submits that the perceived usefulness of a technology, among other aspects, such as the perceived ease of use of the tool, user attitudes towards the tool, and intended uses of the tool, all factor into how users will receive and adopt new technology. The two foundational notions of the model (see Figure 2.3-1) are *perceived usefulness* and *perceived ease of use. Perceived usefulness* is defined by Davis as the extent to which a user believes the technology will improve her or his performance, whereas *perceived ease of use* is conceived as the amount of effort a user imagines they must exert to use the new technology. Applying the Technology Acceptance Model's notions to this dissertation, it is conceivable learners' perceptions of how useful the RWT is for developing their writing and how effortless the program is to use for draft revision will weigh into participants' willingness to accept and continue to use the AWE software.

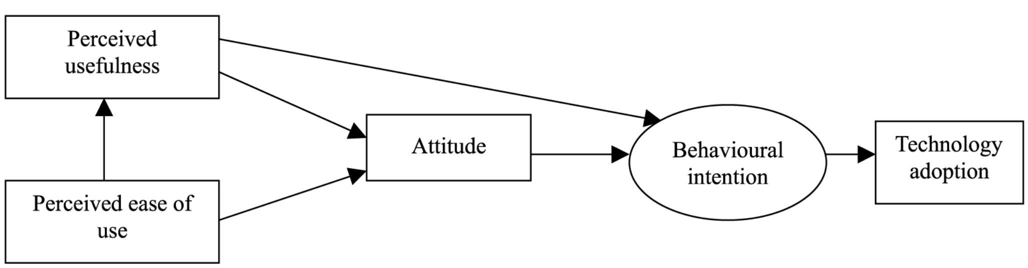


Figure 2.3-1. The TAM (Technology Acceptance Model), (Davis, 1989)

The level of trust users have in automated systems also seems to greatly impact learners' perceptions of as well as reliance on and use of the technology. Madsen and Gregor (2000) characterize user trust as how confident users feel when interacting with an artificially intelligent system and how willing they are to act on the system's provided suggestions. Research in human–computer interaction (HCI) has explored issues surrounding user trust in automated systems and, though primarily conducted in military spheres (e.g., air traffic control, aviation, maritime operations), may lend indispensable insight into understanding how learners develop trust in AWE programs. One key insight implicates user trust as it relates to reliance or dependence on automation. Lee and See (2004) survey a number of studies, citing real-life instances in which humans have relied too much on automation to the point of danger or fatality. The authors reference a study by Sparaco (1995) in which pilots of an Airbus A320 were observed to trust the plane's autopilot to the extent that they neglected to intercede when the autopilot malfunctioned, and the plane ultimately crashed. In a similar instance involving overreliance on failed automated technology and lack of human intervention, crew members of a Royal Majesty cruise ship allowed the vessel to stray off course for an entire day before eventually hitting land after the ship's automated navigation system failed (Lee & Sanquist, 2000; National Guard, 1997). Lee and See (2004) conclude that automation could become problematic when users develop an inappropriate reliance on it.

HCI scholarship also offers useful schemata for describing the development of user trust in automated systems. Lee and See (2004) have devised a conceptual model which considers user trust from organizational, sociological, interpersonal, psychological, and neurological standpoints, taking into account how contextual variables, characteristics of the automated technology, and human cognitive processes altogether influence users' trust in automation. The model (see Figure 2.3-2) portrays the development of user trust as a dynamic process that impacts human dependence on automated systems; the operator, context, automation, and interface are all components affecting the trust users have in the automated system and shaping users' behaviors during human–system interactions. Lee and See's model paints the connection between user trust and user reliance on automation as a complex relationship involving not only subjective user variables, such as users' individual workload, attempts to engage, identified risks, and personal self-confidence, but also social, institutional, and environmental elements. Consideration of the contextual influences in Lee and See's (2004) model may help L2 researchers discover how learners develop appropriate or inappropriate trust in AWE systems as they use automated feedback for revisions.

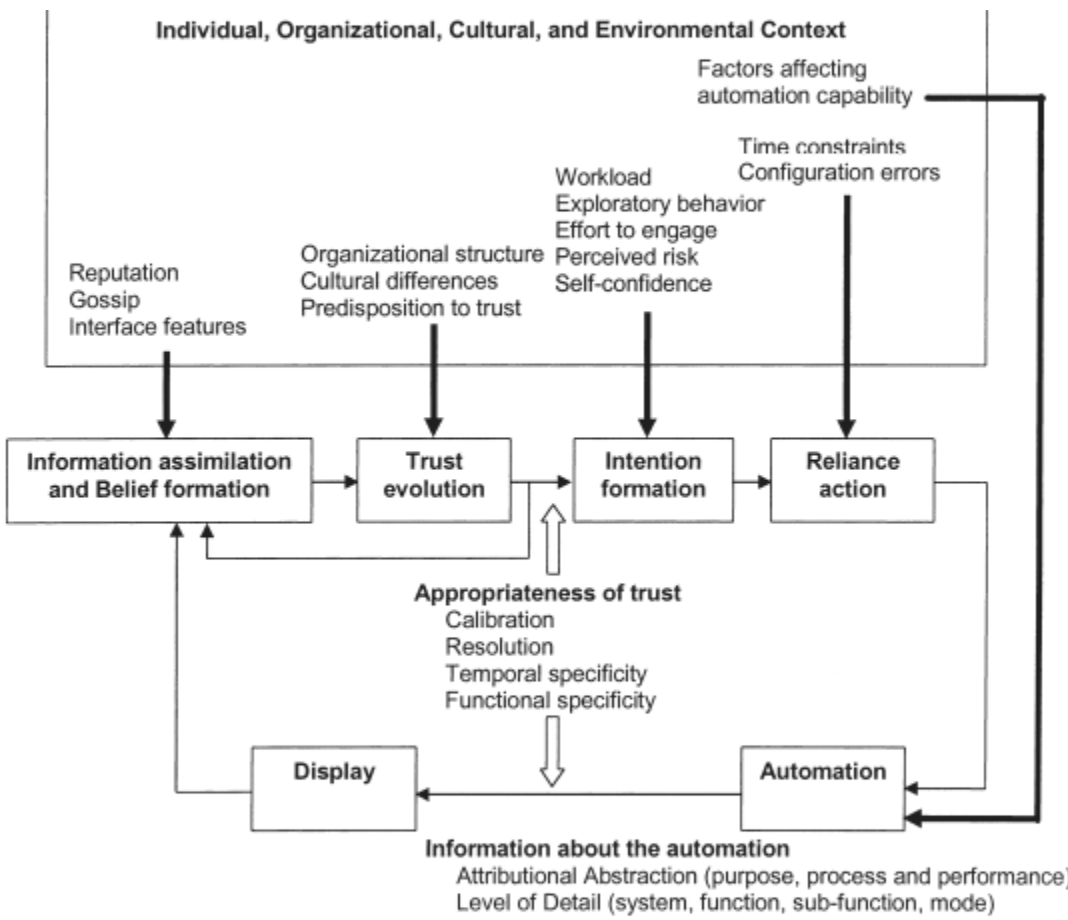


Figure 2.3-2. Lee and See's (2004) dynamic model for the development of user trust in automation

Evidence of trust impacting use of and reliance on automated systems certainly appears in AWE program research. In a study of pre-service teachers' use of formative automated feedback, Scharber, Dexter and Reidel (2008) found that their students' trust in an AWE system had bearing on whether or not students claimed they would use the tool again. Additionally, the researchers observed that student awareness of the AWE software's strengths and weaknesses also affected to what degree learners felt they could trust the feedback; these findings align with Lee and See's (2004) model, in which a tool's reputation, hearsay about the technology prior to its use, and interface offerings impact users' trust in and reliance on the automated system. Scharber et al. (2008) also noted that not all users preferred to be conscious of the AWE tool's capabilities and limitations, or understand precisely how the tool functioned prior to their use of the AWE program for formative writing development.

However, Grimes and Warschauer (2010) warn that students' as well as instructors' lack of awareness of the capacities and shortcomings of an AWE tool may lead to unwarranted trust in the tool. The authors reason that the unwarranted trust may result from noticing of the automated tool's perhaps human-like abilities, causing the students, or even teachers, to deem the software just as qualified to provide valuable formative feedback as a human. As Reeves and Nass (1996) argue, humans have an inclination to regard technologies as social actors. Because the lack of awareness about what an AWE tool is or is not equipped to do could bring about inappropriate trust in the tool or its automated feedback, an investigation of learners' awareness of a program's capabilities, pre and post-interaction, may help instructors and program designers in deciding how to effectively present and manipulate new AWE or CALL technology in the L2 learning classroom.

Because AWE programs are introduced through the writing instructor, a teacher's trust in the automated tools may also ostensibly affect learners' perceptions of trust. For example, Chen and Cheng (2008) found that students perceive AWE feedback as more effective in the cases wherein their teachers had declared their own trust in the automated feedback. Grimes and Warschauer (2010) similarly found that students' trust in AWE software was reinforced by the instructor and sometimes, if little is said by the instructor about how much to trust the tool, students may assume it is reliable. Due to this propensity to *over*trust the automated feedback, it seems integral the AWE technology's intended applications, abilities, and limitations be clearly explained to students prior to their hands-on practice using the program.

A further observed influence on learners' perceptions of an AWE tool is the degree of control learners have in manipulating the tool. According to Heift (2002), learner control is the extent of control students may exercise in an instructional situation. Learner control may involve anything from students choosing what system features to explore next in a CALL environment to what activities users complete and in what sequence (Heift, 2007). In Wang and Xian's (2011) case study of EFL students' error correction practices and writing development when using the automated writing evaluation system Writing Roadmap2.0 (WRM), the researchers found that students cited the capability to control draft editing in the WRM system as a positive feature impacting their overall opinion of the AWE program. Similarly positive findings were reported by Cotos (2010) in her investigation of NNSs' formative evaluative use of the AWE tool IADE. Cotos found that the AWE software's provision of multiple forms of feedback allowed learners the power to explore feedback on their own terms, an aspect that encouraged further interaction with the automated system. Nix and Wylie (2011) reason that it is the empowerment students feel when they have the chance to self-regulate their own learning experience which promotes positive opinions about a computer-based tool. Studying the control learners perceive they can exert over a CALL program's capabilities holds enormous value in assisting researchers, instructors, and CALL program developers to know how interactional decisions are forced or facilitated by the available functions and features of computer-based tool, and how a program may restrict or provide for autonomous learning (Heift, 2002).

Regarding Teacher Perceptions of AWE

As teachers play a pivotal role in the introduction, integration, and continued use of AWE software, it is important to consider the perceptions of the instructors using the automated tools in the writing classroom. Teacher perspectives on AWE tools are of particular importance when taking into account how writing instructors' opinions of and attitudes towards use of AWE programs shape learners' trust in and motivation to use the tools, not to mention the subsequent and inevitable impact on student writing (Chen & Cheng, 2008; Scharber et al., 2008). This section addresses what teachers distinguish as benefits and drawbacks to the use of AWE in writing instruction as well as teacher attitudes towards the technology itself; as teachers' perspectives on AWE tools have been investigated less than student perceptions of the instructional technology, a large portion of the reviewed research derives from two studies, one by Chen and Cheng (2008) and another by Grimes and Warschauer (2010), both of which examine instructors' perspectives on the use of the AWE tool *My Access* in L2 writing classrooms.

One key trend in the research on teacher perspectives of AWE software is the apparent skepticism some writing instructors feel concerning the quality of the automated feedback and its usefulness for improving student writing. Findings from Chen and Cheng's (2008) study revealed instructors' heightened preference for human feedback, specifically in the more meaning-focused and linguistically complex areas of content development, style, and coherence. The fixed nature of the automated feedback given by *MyAccess* also prompted some instructors to believe the AWE feedback to be formulaic and imprecise, thereby being of little use to learners in the drafting stages of writing. The vagueness of the feedback was also perceived to somewhat increase the teachers' workload by forcing teachers to take time to clarify the ambiguity of the feedback. Two of the three instructors studied in Cheng and Cheng's research held more confidence in their own assessments of student work, and regarded the automated feedback helpful only for assisting students in improving basic syntax and organizational structures.

It is possible some teachers' skepticism may not only be rooted in doubts about AWE programs' capabilities, but also in a fear of being eventually replaced by automated systems. The notion of the writing instructor as dispensable has been addressed by a number of authors conducting research on AWE programs (Chen & Cheng, 2008; Cheville, 2004; Cotos, 2011; Grimes & Warschauer, 2010; Warschauer & Grimes, 2008), with overwhelming concurrence that no machine-generated feedback will nor should substitute the feedback offered by a trained writing instructor. One rationale for this outlook springs from composition scholars' perceptions of writing as a social action involving negotiation of meaning amongst the writer and reader: "Writing-to-a-machine violates the essentially social nature of writing: we write to others for social purposes" (CCCC Executive Committee, 2004). Thus, a writing process in which the human instructor, the reader, is absent is no longer an authentic social practice. Furthermore, Grimes and Warschauer (2010) argue that writing instruction necessitates the use and adaptation of pedagogical approaches that meet the evolving needs of learners, a flexibility not afforded by writing assistance technologies.

Yet while no researchers have suggested a human instructor be removed from the essay revision and evaluation process, the replacement of the teacher with technology for specific writing tasks has been explored (Chen & Cheng, 2008). Chen and Cheng, for instance, advise using AWE tools for tasks engaging students in the noticing and correcting of grammatical or syntactic errors. A number of researchers (Chen & Cheng, 2008; Cotos, 2011; Grimes & Warschauer, 2010; Shermis & Burstein, 2003; Ware, 2005; Warschauer & Ware, 2006) recommend feedback provided by artificial intelligent systems be incorporated as a supplementary means for students to revise their papers, using the automated feedback in addition to, as opposed to a replacement for, peer or teacher feedback.

Despite the observed teacher distrust of automated systems, CALL research has likewise uncovered a number of benefits to the use of AWE in writing instruction. The most commonly cited advantage of using AWE programs for formative and summative writing assessment is that the tools save instructors time in and out of the classroom. A fundamental way the tools are time-saving for teachers lies in their ability to score and respond to student essays. When used for formative purposes, AWE eases the workload of writing instructors by providing students instant feedback in the drafting stages (Warschauer & Grimes 2008). This alleviates what Grimes and Warschauer (2010) call a “bottleneck” effect that occurs when student drafts are turned in, but receipt of feedback is delayed (sometimes several days to a week) because of the teachers’ inability to review and respond to a large number of student papers in a short amount of time (p. 4). The delay, in turn, causes learners to lose interest in the teacher’s comments by the time the feedback is received. Instantaneous feedback provided by an automated writing evaluation tool removes the bottleneck, thus supplying learners with the opportunity to immediately recognize and address problematic aspects of their drafts in areas concerning grammar, language use, and organizational structure (Chen &

Cheng, 2008), and releasing teachers to focus on providing more personalized, content development- and meaning-related feedback to individual learners (Warschauer, 2010).

AWE also promotes efficiency in the classroom by reducing the time and energy teachers expend on class preparation. *MyAccess*, for example, supplies instructors with a store of writing prompts from a variety of genres. Instructors may select these prompts for writing assignments and the system is able to generate automated feedback appropriate to the specified prompt (Chen & Cheng, 2008). Some AWE programs may also come equipped with embedded supplementary resources for students to use during draft revision, saving teachers time in looking for and consolidating quality writing assistance tools. *MyAccess* supplies users with embedded tools that check students' spelling, grammar, mechanics, and style (*My Editor*), allows users to search appropriate synonyms for given words (*Thesaurus*), offers words and phrases relevant to particular genres (*Word Bank),* and archives past drafts so learners and teachers may inspect progress through the drafting stages (*My Portfolio*). Teachers in Chen and Cheng's (2008) investigation mentioned that these in-program tools simplified students' and teachers' search for materials by merging the resources into one central location.

While the long-term payoff of AWE use may be saving writing instructors' time, the initial familiarization with and adjustment to the AWE software can be perceived as time-consuming from instructional *and* institutional standpoints. Familiarization with new CALL technologies takes time for learners as well as the writing instructor. In order to secure proper learner adaption to the new technology, some instructors may need to rethink their entire course syllabus. Teachers in Chen and Cheng's study (2008), for example, cited the need to reallocate coverage of content in their syllabus, allotting large blocks of the schedule for student training using the AWE software.

Frequently, lengthy periods are also required for the writing instructors to adapt to, and learn to take full advantage of, new AWE technologies. Grimes and Warschauer (2010) posit that a possible cause for positive teacher response to AWE software lies in adequate training and continued support for teachers learning a new AWE program. In Grimes and Warschauer's study, teachers received, at minimum, one full day of training using *MyAccess*; additionally, teachers were provided longitudinal support in the form of peer networks and through informal tutoring sessions with a designated *MyAccess* expert guide at the school. Instructors in Chen and Cheng's (2008) study did not receive such extensive instruction or sustained assistance. The extent of the *MyAccess* training given to the three instructors in Chen and Cheng's research was a one-hour training workshop given by a *MyAccess* specialist during which teachers were shown and described the tool's features and functions; during the workshop teachers received no hands-on practice with *MyAccess* or recommendations for effective incorporation into writing instruction. The teachers in Chen and Cheng's study were obliged to take extra time to become familiar with the tool's capabilities and limitations, which, not surprisingly, negatively impacted their attitudes towards and willingness to use the AWE tool, and their understanding of how *MyAccess* could be used to promote writing improvement. Because it has been documented that teachers' confidence in an AWE program increases with supplementary training and prolonged experience (Grimes & Warschauer, 2010), departments and programs would likely benefit from investing in hands-on training workshops as well as continual support for teachers to encourage positive opinions about and enthusiasm for using automated feedback in the writing classroom.

There is general consensus that the use of automated feedback, for summative scoring or for formative evaluation purposes, spurs major shifts in teachers' selection and presentation of curricular content. Instructors in both Chen and Cheng's (2008) and Grimes and Warschauer's (2010) studies remarked that the inclusion of the AWE program *MyAccess* significantly impacted what they chose to cover in the course. *MyAccess*'s preferences for the standard five paragraph essay pressured some teachers to teach to the system, opting to teach more formulaic models of essay structures as opposed to teaching genres, styles, and organizational structures not readily identified by *MyAccess*. Similarly, AWE programs may restrict the topics and genres of the essays teachers assign. Because *MyAccess* can support a limited number of essays written in particular genres and on the topical prompts supplied by the program, teachers who wish to continue use of the program are bound by the system parameters. In Grimes and Warschauer (2010), those instructors who sought to give their learners practice writing in divergent genres not covered in *MyAccess*, such as newspaper articles, advertisements, and business letters, or on varied topics not furnished by the program, had to choose either to not incorporate the desired genres or topics or simply not use the AWE technology for given units.

In addition to questioning the content to be covered, teachers are similarly concerned with how and when to present AWE tools in the writing process. In Chen and Cheng's (2008) study, the three teachers under investigation employed *MyAccess* at differing times during the semester: one during the final evaluation for summative purposes, one during the entire drafting process for primarily formative purposes, one through all stages, from the beginning to end, of the writing evaluation. However the tools are incorporated, Grimes (2008) insists all instructors "critically evaluate whether and how to deploy [AWE tools] to best meet their and their students' needs" (p. 35).

As seen in this review of research investigating the effectiveness of automated writing evaluation systems, there is much that remains unanswered in terms of what necessarily makes an AWE program "effective," how both learners and teachers perceive the value of the automated feedback or the tool itself, and how the tool's feedback meets the needs of individual writers. Seemingly, there is an apparent need for more multidimensional investigations into the processes by which learners interact with their peers and AWE resources, the capabilities and limitations of the AWE tool, and students' and instructors' perceptions of not only learner accomplishments, but also of the process of receiving and incorporating automated feedback for draft revision (Lai, 2010; Storch, 2005; Warschauer & Ware, 2006).

Section 2.4. Exploring User Behaviors in AWE Tool Interactions

In addition to researching the effectiveness and perceived effectiveness of AWE tools, it is also essential to investigate their in-process use as well as strategies learners employ when interacting with the tools (Long, 1984; Warschauer & Ware, 2006). Yet the study of learner behaviors during in-process interactions with AWE software remains a less common investigative interest for researchers studying uses of automated feedback for writing development.

User interaction research on AWE programs has been generally valued from the standpoint of distinguishing how AWE tools are used to better facilitate language learning, a research focus corresponding to the linguistic output-oriented AWE effectiveness studies. Researchers rationalize these joint explorations of learners' demonstrated writing improvement and AWE interactions by claiming the extent of effectiveness of AWE tools as well as students' *perceived* effectiveness of the tools, is tied closely to how they are used (Chen & Cheng, 2008; Grimes & Warschauer, 2010).

What many linguistic production-centered AWE studies fail to attend to are the actual behaviors learners exhibit when receiving and applying automated feedback as well as users' reflections on these interactions. One paper integrating both user interaction statistics and user reflections on interactions is Nix and Wylie's (2011) investigation of how AWE tools allow learners to self-regulate their learning experience. Nix and Wylie examined students' user interaction data recorded by an AWE tool and "learning logs," in which learners reflected on their interactions with the automated system; in both data sets, the authors observed themes corresponding to motivational, behavioral, and cognitive variables that were linked to when and where students read onscreen feedback and when it became most useful to them. The authors insist that allowing students the opportunity to provide feedback about their interactions with the AWE tool facilitated a deeper engagement with the tool as well as furthered the researchers' understanding of the stimulators and obstacles for learner interaction with and application of the feedback.

Drawing on the Concept of Usability

Understanding what aspects of a tool impede or assist learners in developing their writing using automated feedback is the ultimate motivation for conducting user behavior research. Yet the lacking literature on learner behaviors in AWE interactions should compel language learning researchers to consider other disciplinary models which may offer more sophisticated frameworks for understanding the complexities of users' CALL behaviors. The concept of usability, borrowed from human–computer interaction (HCI) research, may help establish a basis for a discussion of user behaviors in AWE program interactions. In HCI literature, usability refers to a computer-based material's ability to facilitate fast, simple, and successful use for human users (Shackel, 1991); in other words, usability considers how easy a program is to use and how well the program allows for the functions users need to complete a task in a specific human–computer interaction.

Additional applicable usability principles are supplied by the International Organization for Standardization (ISO), an organization which promotes proprietary, industrial, and commercial standards worldwide. ISO standard 9241, otherwise known as *Ergonomics of Human System Interaction*, includes considerations which are of particular relevance to conducting in-depth investigations of language learners' use of AWE programs. ISO standard 9241 deals with matters such as who the users are, what they need, want, and expect of the computer interaction, and the context for the human–computer interaction. Making use of ISO standard 9241 in AWE or CALL user interaction research could spur important questions, such as: is the task appropriate for the learner and the learning process, is the program suitable for individualized learner experiences, how well does the learner–computer interaction match the learner's expectations, are the tool's features and abilities transparent to the user, and how controllable is the program. Asking these or similar questions in examinations of user interactions with AWE software, language learning researchers may uncover practical information about an interface's overall ease of use, how well learners can receive, understand, and incorporate automated feedback for draft revision, how enjoyable it is to use the AWE program, and how much confusion users encounter when first using the tool (Nielsen, 2012); this knowledge can be converted to feedback which is equally constructive for AWE system designers and L1 (first language) or L2 writing instructors and researchers.

Though perhaps seemingly complicated, capturing usability data in student–AWE software interactions is very much an attainable task for language learning researchers. For example, obtaining data on user behaviors could be accomplished by accessing recorded movements saved in a program's database. Recorded database information such as frequency and/or length of mouse hovers (Pretarget, 2012), number of submitted drafts to an automated system, or timestamps on student activity (Shute, 2008) could be of interest to investigators wanting detailed accounts of individual users' interactions with an AWE tool. Behavioral data could also be easily collected by directly capturing learners' on screen interactions using screen recording software. By assembling a variety of interactional data, researchers can compose an unambiguous narrative of learners' multilayered experiences using AWE programs to revise written drafts.

Observing Learner Interaction Strategies

Another highly under-researched area in the field of second language learning concerns the strategies learners use when interacting with AWE programs. Studies conducted by Pujola (2002) and Heift (2002) are the exceptions. Pujola (2002) investigated students' use of different strategies when interacting with help capabilities provided by a web-based multimedia CALL program called ImPRESSIONS, which aims to develop second language learners' reading and listening skills and language learning strategies. Pujola analyzed observational notes, stimulated recalls, and screen captures from ELLs' recorded interactions with ImPRESSIONS to get a detailed depiction of the strategies students used when interacting with the software's dictionary, cultural notes, transcripts, subtitles, and play control functions. Pujola's findings reveal that many factors, including individual learner characteristics and convenience of the CALL learning environment, impact the quantity and quality of students' usage of provided help functions. The research points to the need for further investigation into learners' unique traits and feelings about ease of access in the learning environment.

Efforts have also been dedicated to classifying learner behaviors according to intentional strategies observed in student–AWE tool interactions. In a study on L2 learners of Germans' interaction with the web-based *Intelligent Language Tutoring System* (ILTS), which gives learners feedback about specific errors and also provides the opportunity for users to peek at the right answer prior to submitting their response for review, Heift (2002) tracked students' interactions with ILTS by recording the frequency and types of links learners used, then classified students' behavior data according to how they interacted with the tool's given capabilities; specifically, classifications were grounded in the demonstrated control learners exerted over the error correction process. An important contribution of Heift's work is his assignment of students to four different interactional categories, *browsers, frequent peekers, sporadic peekers,* and *adamants,* based on how they interacted with the available options provided by ILTS. Identifying learner interaction in this grouped manner, Heift claims, allows L2 learning researchers to discern patterns in how learners exercise control over a CALL program's capabilities. Based on a related finding from the study revealing that learners' linguistic proficiency affects the interactional category to which the student belonged, Heift (2002) further recommends that researchers conduct joint investigations of user interactions and learner characteristics to understand the variables influencing how students interact with CALL tools.

Outside of L2 learning research, HCI literature offers novel and imaginative notions for perceiving technology users' strategies for gathering and making sense of available information. One particularly illuminating human–computer interactional concept comes from cognitive psychologist Peter Pirolli (1997; Pirolli & Card, 1995, 1999) who developed the theory of *information foraging,* an ecological-cognitive framework for analyzing users' strategic information consumption per cost (time or energy) expended. Information foraging theory draws heavily on the behavioral ecology theory of optimal foraging, which asserts that animals forage for sustenance in ways that enable them to maximize their net energy intake per unit of time (MacArthur & Pianka, 1966). As an animal's survival and reproductive success are dependent on energy intake, the animal must adapt to optimize its rate of caloric consumption, adopting behaviors for locating, capturing, and consuming food with the most calories in the least amount of time possible (Kamil, Krebs, & Pulliam, 1987). Because various food types, all yielding different amounts of net energy, are scattered throughout a given habitat, an organism must evolve strategies for maximizing energy returns per energy expended. Thus, the optimal forager is one that considers the costs of hunting for its food and develops successful strategies for maximizing its "energetic profitability" given its environmental parameters (Kamil et al., 1987).

Pirolli (1997) applied optimal foraging theory's foundational concept of energy maximization to a heuristic for exploring technology users' hunt for relevant information given time and resource constraints. Just as no predator eats every prey available, no technology user consumes every information resource she comes across; instead she develops strategies for evaluating the profitability of encountered resources per access cost, prevalence, and handling time. Similar to animals foraging for food in the natural world, humans navigating information-dense physical and virtual spaces recognize that high-yield patches of relevant information are scarce. To locate those high-yield patches, technology users often engage in what Pirolli (1997) calls *scent-following*, or trailing proximal signals, such as bibliographic citations, internet links, or symbols representing the desired knowledge, that lead to the information of interest. When the *information scent* is acute, the forager makes intentional moves in pursuit of the anticipated information payoff. However, when there is no scent whatsoever, the forager may wander, searching haphazardly in the information repository (Pirolli & Card, 1999). Upon finding the appropriate information, its profitability is determined as the worth of the information obtained per effort expended to acquire the source, and a strategy may be developed for tracking down similar information in the future. Pirolli's depiction of the technology user as a forager of information could be applied to the current work if we conceptualize learners' initial interaction with the RWT for draft revision as a process of strategy development for locating and exploiting high-yield patches of relevant information (automated feedback, concordancer examples, etc.). Conceiving of the RWT user, or CALL tool user in general, as an information forager may also shed light on ways AWE or CALL program designers could highlight pertinent information resources offered by the instructional technology so the learner may more easily recognize and exploit the tools to develop their writing.

Section 2.5. Establishing the Influence of Individual Learner Variables

Heift (2002; 2007) does not stand alone in her call for concurrent investigation of learner variables and learner behavioral strategies in interactions with AWE systems. Cooper (1993; 2004), Gouli et al. (2005), Calvo and Ellis (2011), and Chen and Cheng (2008) have also stated the need to delve deeper into learners' individual characteristics and personalities to better understand the complexities of student involvement in learner–tool interactions. This deeper exploration inevitably implicates elicitation of demographic information from learners, perhaps through participant interviews or surveys, with the intention of uncovering possible connections between learner variables (who learners are) and behavioral patterns or strategies (how learners act) in CALL interactions (Heift, 2007).

Aside from collecting basic information about learner demographics, such as gender (Grace, 2002; Heift, 2007) or L2 proficiency (Chen & Cheng, 2008; Heift, 2002), additional self-report information about learners' reasons, expectations, or enthusiasm for using CALL resources may also be useful for discovering relationships between learner characteristics and behaviors. Skehan (1998) and Dörnyei and Skehan (2003) have discovered that students' emotional involvement in the interactions impacts not only how learners interact with CALL materials, but also the extent of their language learning with the materials. According to Shute (2008) and Chen and Cheng (2008), factors such as students' intrinsic motivation, their capacity for autonomous learning, metacognitive skills, and even attitudes towards a program may influence how learners act in AWE interactions.

Proposals for dual study of learner variables and learner behaviors in AWE and CALL environments are not merely part of a more recent trend in L2 learning research. In an early framework for CALL evaluation, Hubbard (1988) acknowledges student variables, such as declared learning style and level of linguistic ability, as critical components of learners' computer interactions. Chapelle's (2001) model for evaluation of CALL programs incorporates similar learner-focused elements for determining what she terms "learner fit," requiring analysis of the "extent to which a CALL task engages learners in language at a useful level of difficulty in a way that is appropriate to their individual characteristics" (p. 80). For a CALL program to demonstrate suitable learner fit, it must allow opportunities for learners to interact with and through the language in appropriate conditions relevant to their learner characteristics. Those establishing whether a CALL program exhibits appropriate learner fit should determine whether the computer-based task or application addresses the difficulties experienced by the learners and recognizes and integrates the specific content areas in which learners need an L2 to function. Instructors should then adopt pedagogical approaches to interact with learners in ways appropriate to their learning styles, and assess learners' knowledge development and capabilities throughout the instructional period. Acknowledging learner characteristics in the design and evaluation of CALL tasks will help ensure suitable materials are selected for given learning contexts.

Yet gathering information about learner characteristics should not implicitly denote certain correlations between learner behaviors and specific variables, Heift (2007) cautions.

The information should, however, help researchers understand those variables which could be given less attention because of their diminished impact on CALL interactions. For instance, there is mounting evidence for gender being an insignificant indicator for how students learn to use CALL tools (Grace, 2002; Heift, 2007). If enough evidence is gathered, researchers may bypass the variable of gender in favor of concentrating on other potentially influential learner variables in human–CALL program interactions.

Identifying Learner Personas in AWE Interactions

To facilitate combined investigations of learner variables and learner behaviors using AWE programs, L2 learning researchers may benefit from the study of learner "personas." Instructional technologists use the notion of "personas," or archetypical users of a technology who represent the requirements, objectives, and characteristics of broader groups of users (Heift, 2007), to help describe interactive aspects in the design and development of computer programs. Applied to the study of learners' involvement in CALL environments, research on learner personas could help account for patterned learner behavior as it relates to learner characteristics, such as level of L2 proficiency, L1, educational background, computer literacy, and motivation (Colpaert, 2004; Dornyei & Skehan, 2003; Heift, 2007; Levy & Stockwell, 2006).

Despite the fact that the personas are essentially fictitious, they are representations of actual users based on findings from empirical user research, and they hold enormous potential for informing the design and implementation of CALL tasks and tools. For the current work in particular, identifying learner personas could help instructors using the RWT devise means for personalizing RWT use in drafting stages so that the tool's feedback is, at once, suited to a breadth of learner personas in a given classroom (Heift, 2007). Similarly, identification of learner personas may alert other AWE program designers to ways in which automated feedback could somehow be adjusted to suit the individual and create personalized, instructional experiences (Cooper, 2004). Beyond AWE program design, distinguishing learner personas may also hold implications for the design and implementation of CALL software which adapts to meet the needs of a variety of L2 learners. Though it is impossible to create a learning environment entirely suited to each individual learner, by clustering similarities and differences among learners, we may at least identify the optimal conditions for effective computer-based writing development according to learner persona criteria (Heift, 2007).

Surveying Learner Background Experience with Technology

Investigating students' ability to successfully engage with new AWE software necessarily involves questions regarding how equipped learners are to utilize new technology. *Student readiness*, a concept advanced by Oliver (2001), attempts to verify students' basic familiarity with technology prior to their entering into online learning environments. Considering student readiness for CALL activities would help researchers establish students' current technology skills and frequency and type of access to technology, factors impacting learner autonomy and capacity for self-regulated learning in computer-based interactions (Leahy, 2008; Oliver, 2001).

It has further been demonstrated that students' perceived computer self-efficacy, or appraisal of their abilities to use a computer for certain tasks, positively correlates with users' willingness to engage in computer-based tasks as well as anticipate success when working with the technology (Compeau & Higgins, 1995). Technology users who believe themselves to be more proficient at executing computer-based tasks are said to demonstrate high computer self-efficacy, while those who perceive themselves less adept at accomplishing computer-mediated tasks are described as exhibiting low self-efficacy (Sam, Othman, &

Nordin, 2005). Expectedly, research has shown that technology users who identify themselves as having high computer self-efficacy have had more prior experience with computers than those claiming to have low computer self-efficacy (Harrison & Ranier, 1992; Hill, Smith, & Mann, 1987). Heightening language learners perceived computer self-efficacy is central to CALL, because the degree to which students have confidence in their computer abilities impacts a number of variables: the control learners feel they have when using the technology (Sproull, Zubrow, & Kiesler, 1986), students' ability to perform computer-based tasks, the anxiety levels they experience when interacting with the technology, and their attitudes towards the tasks and the technology itself (Busch, 1995; Zhang & Espinoza, 1998). Though L2 instructors cannot control for learners' prior experience with computers, it is practical for teachers to identify which students exhibit low computer self-efficacy and work to relieve these learners' anxiety through proper training, practice with, and support using the new CALL application.

By collecting data on learners' past use of and comfort level using technology, perhaps through self-report question items on surveys or questionnaires administered prior to students' interactions with new language learning programs, researchers obtain a baseline of learners' background technological experience (Oliver & Towers, 2000; Rimrott & Heift, 2005; Shi, Reeder, Slater & Kristjansson, 2004). This information may be useful in helping writing instructors identify students' technological literacy skills (Rossiter & Watters, 2000), or their abilities to solve problems and communicate the solutions using technology (McCade, 2001). Applying knowledge of language learners' readiness to interact with new AWE programs will enable writing instructors to better adapt their instruction to fit the needs of individual learners, lending more or less support to individual learners as they use automated feedback to develop their written drafts.

As is evident from this literature review, few language learning studies have explored students' perceptions of AWE tools in tandem with learners' behaviors using the AWE programs. Likewise, few researchers have deliberated on the role of learner variables in students' interactions with AWE systems. Instead, the majority of AWE research has prioritized student output in an aim to establish the value of AWE software as based on learners' demonstrated writing achievement using AWE feedback. However, as Hyland and Hyland (2006) suggest, the quality of the feedback, the means of delivery, individual student characteristics, and how the feedback is used by learners are all factors which must be considered when examining learners' use of AWE software for formative purposes. Research which gathers information about learner characteristics and experiences with technology, analyzes students' in-process interactions using the AWE tools, and considers learners' perceptions of a tool's usefulness is needed to address current gaps in the study of potential pedagogical uses for automated writing evaluation software.

Section 2.6. Research Questions

Based on the call for multidimensional exploration of students' perceptions of (Lai, 2010; Storch, 2005; Warschauer & Ware, 2006) and interactions with AWE tools (Long, 1984; Storch, 2005; Warschauer & Ware, 2006), this dissertation aims to take a user-focused and process-oriented approach to investigating learners' use of the RWT tool for analyzing written drafts of Introduction sections. Because prior research has shown students' perceived effectiveness of a tool is connected to perceptions of its usefulness (Chen & Cheng, 2008; Cotos, 2011; Li, 2002; Page, 2003; Warschauer & Ware, 2006; Ware, 2011), trustworthiness (Chang & Tung, 2008; Davis et al., 1989; Hyland & Hyland, 2006; Yang, 2004), and allowance for user control (Heift, 2002; Leahy, 2008), this study investigated "effectiveness" of the RWT in terms of students' perceived usefulness of and trust in the RWT as well as the degree of perceived control learners have in interacting with the RWT. The following research questions guided the study:

RQ1a: *How do learners perceive the usefulness of the RWT?*
RQ1b: *To what degree do learners trust the RWT?*
RQ1c: *What degree of control do learners perceive they have when using the RWT?*

RQ2a: *How do learners interact with the RWT tool?*
RQ2b: *What strategies do learners report using in their interaction with the RWT?*

RQ3a: *How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?*
RQ3b: *What other learner variables do participants perceive as impacting their interaction with the RWT?*

The first set of research questions hold the primary focus of this dissertation research, which aimed to principally investigate learners' perceptions of the RWT and their experience using the tool for Introduction section draft revision. The second and third sets of research questions comprise a secondary concentration of this study by exploring users' interaction with and strategies for using the RWT, and perceptions of how their learner variables, such as knowledge of and previous experience with technological tools, impacted their RWT experience.

CHAPTER 3. METHODOLOGY

Section 3.1. Research Design

This study used a mixed methods design which was modeled on previous studies investigating learners' perceived effectiveness of AWE tools and AWE feedback (Chen & Cheng, 2008; Cotos, 2011; Grimes & Warschauer, 2010) and studies examining user interaction with AWE tools (Nix & Wylie, 2011; Pujola, 2002). The mixed methods research approach entails the intentional use and combination of qualitative and quantitative research methods. While quantitative data collection and analysis techniques (largely deductive) enable empirical scientists to measure the extent of what are "known" observable facts and causal relationships, qualitative techniques (largely inductive) enable the examination of unknown phenomena, descriptions of how processes are brought about, and the spectrum of their impacts on the world (Pasick et al., 2009). Conducting a study using a mixed methods model requires not simply collecting varied forms of quantitative and qualitative evidence, but rather encompasses intentional integration, as opposed to segregation, of both types of data (Creswell & Plano Clark, 2011). Furthermore, using the quantitative and qualitative approaches as supplements to one another "bring[s] out the best of both paradigms" (Dornyei, 2007, p. 45), cancelling out each methods' weaknesses and allowing provisions for more contextualized and rigorous data collection, analysis, and interpretation.

In this study, such an incorporation of both quantitative and qualitative means for answering the research questions helped to enrich both the data exploration and also the meaning which could be derived from the results through the adoption of multiple, not singular, perspectives in data selection, collection, analysis, and interpretation. Gathering quantitative and qualitative data allowed for the researcher to construct a macro view of language learners' experience with an AWE system (in investigating the class's overall understanding and use of the RWT) while simultaneously compiling a micro view (in studying each individual learner's perceptions of and interactions with the RWT) of participants' experience with the AWE tool (Plano Clark, 2010). From the construction of both macro and micro depictions of users' RWT experience emerged a complementary, contextualized sense of how language learners used and perceived their use of the RWT as they revised their writing.

Another justification for employing a mixed methods design pertained to the model's ability to easily facilitate the inclusion and application of different theoretical backgrounds. Creswell and Plano Clark (2011) maintain that a valuable aspect of mixed methods studies pertains to their capacity to accommodate a variety of theoretical perspectives. Because this dissertation research is grounded in not one but several theoretical perspectives to genre learning, the mixed methods model offered the capability of construing and elucidating the many research questions from several angles, allowing multidimensionality and comprehensiveness in researching learners' perceptions of and interactions with the RWT.

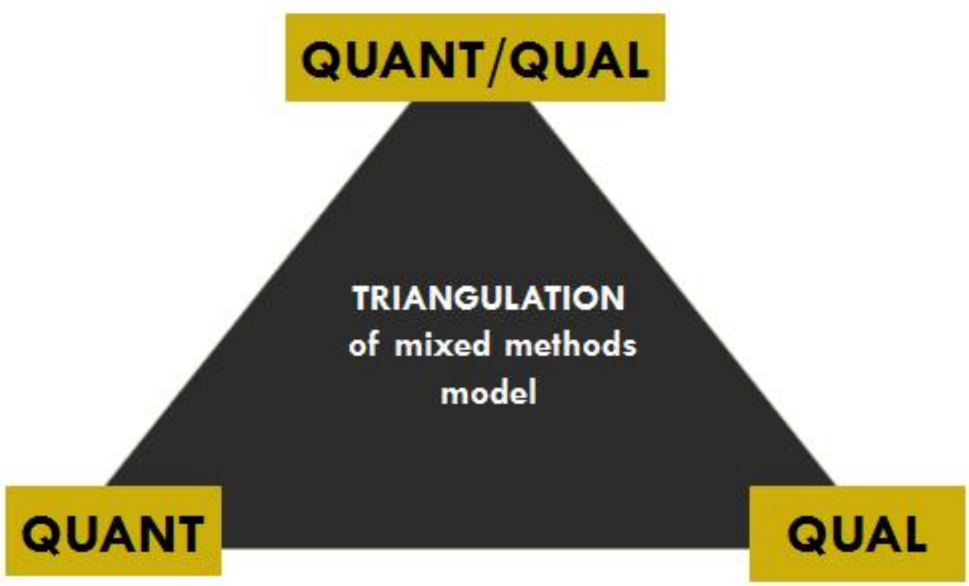


Figure 3.1-1. Triangulation of mixed methods model

Furthermore, to answer each research question, a triangulation of mixed methods model was employed (see Figure 3.1-1). Data triangulation involves the use of multiple different sources and research methods to investigate the same phenomenon. The method allows for a researcher to approach study of the topic or issue from varied perspectives, lending credibility, transferability, or dependability, most typically to qualitative research (Gass & Mackey, 2007). A triangulation model was chosen for this study because it allows elicitation of complementary data from multiple sources (Morse, 1991) in an "attempt to map out, or explain more fully, the richness and complexity of human behavior by studying it from more than one standpoint" (Cohen & Manion, 2000, p. 254). Furthermore, triangulation allows for comparison and validation of quantitative and qualitative data (Creswell & Clark, 2007), adding substantiation to singular quantitative or qualitative results.

Section 3.2. Research Context

This study took place in a face-to-face, graduate-level course offered by the English Department at a large Midwestern university. The course, "Advanced Academic Writing Workshop: Writing Empirical Research," trains graduate students to recognize normative patterns of genre-specific writing, specifically, academic research article (RA) writing, and then apply that knowledge to develop their own writing in that genre. Specifically, the course entails students learning a Swalesian (1990, 2004) move/step rhetorical function schema to analyze sections of the research article (Introduction, Methods, Results, etc.). Recognizing the structure of the RA as controlled by communicative purposes of the text gives novice writers the building blocks for developing complex and sophisticated language as students write and defend choices made in conducting their empirical research (Dudley-Evans, 1994).

The physical setting of the study was a computer lab where students met for their writing workshop. Computer programs mentioned in the Materials section were installed on the class computers prior to the day of data collection. Students' interaction with the RWT took place during regularly scheduled class time, and stimulated recalls were conducted in a one-on-one setting with the researcher and participant in a small computer lab on campus at an agreed upon time outside of regular class hours.

Section 3.3. Participants

Participants were recruited during their scheduled class time. Because previous CALL research has suggested that learner demographics may affect users' experiences with and behaviors using computer-based language learning tools (Grace, 2002; Heift, 2007), learner demographic information, including information such as gender, NS or NNS status, discipline of study, and experience with research article writing, was collected in the pre-task questionnaire. Full participant profiles are summarized in Table 3.3-1.

In total seven females and four males all ranging in age from their mid-twenties to early forties agreed to participate in the study. Seven of the 11 participants were NNSs and four were NSs. Native languages of the NNSs included Spanish, Chinese, Vietnamese, Turkish, Kiswahili, and Taiwanese. All participants whose first language was not English reported on the pre-task questionnaire that they had studied English for more than ten years, with reported durations ranging from ten to over 30 years. The NNSs were all of advanced writing and reading proficiency as determined by their passing an English Placement Test administered to all incoming NNSs of English at the start of their enrolment at the university.

All participants were full-time graduate students studying in disciplines in the natural (Mechanical Engineering, Chemical Engineering, Materials Sciences and Engineering, Physical Chemistry, and Nutritional Sciences) and social (Applied Linguistics and Technology, Education, Statistics and Sociology) sciences. Guidelines outlined by Mackey and Gass (2005) were followed for recruitment to ensure anonymity of students' identity,

Table 3.3-1

Participant Demographic Profiles

Pre-task Question Item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
Gender	F	F	M	F	F	F	F	M	F	M	M
Age	26-30	41+	41+	26-30	41+	26-30	36-40	21-25	26-30	31-35	26-30
Native Speaker/ Non-Native Speaker	NNS	NNS	NS	NNS	NNS	NS	NS	NS	NNS	NNS	NNS
Discipline	Applied Ling.	Stats.*	Mat. Sci. & Eng.*	Applied Ling.	Educ.	Chem.	Nut. Sci.*	Mech. Eng.	Mat. Sci. & Eng.*	Chem. Eng.	Soc.
No. of Papers Published	2	1	0	0	0	5	0	1	1	4	0

Note: * indicates disciplines not represented in the Research Writing Tutor corpus; Ling.=Linguistics, Stats.=Statistics= Mat. Sci.=Material Sciences; Eng.=Engineering; Educ.=Education; Chem=Chemistry; Nut .Sci.= Nutritional Sciences; Mech. Eng.=Mechanical Engineering; Chem. Eng.=Chemical Engineering; Soc= Sociology including use of pseudonyms in place of students' actual names and promise of confidentiality of responses.

Students who were enrolled in this advanced academic writing course were deemed the most appropriate subjects for this dissertation study for a number of reasons. First, the focus of this dissertation is to probe the complexities graduate students, both NNSs and NSs of English, face as they develop academic writing skills using an AWE tool. Students in this particular writing course are commonly of varying first language backgrounds, ages, English language proficiency levels, and exhibit differing levels of technological skills. The population thus presented an opportunity to explore student interaction with the RWT in a diverse population. Second, these particular students had enrolled in the course, because they, and sometimes their advisors, had witnessed a need to improve research writing skills. All students were concurrently conducting research in their fields as they worked to write up their research in this writing workshop. Students in the workshop represented the target users of the Research Writing Tutor, those seeking to develop skills in writing up empirical research and are, therein, a suitable population in which to explore initial interaction behaviors with and perceptions of the RWT.

The instructor of the advanced academic writing workshop also participated in the study as a research informant. A post-task interview was scheduled with the instructor to gain a more complete picture of students' interactions with the AWE tool on the day of data collection. Her observations lent valuable insight into how learners used the RWT for self-analysis of their Introduction section drafts, the assistance learners requested during the interaction, and any in-process sentiments or attitudes learners shared with the instructor or others concerning their use of the RWT. Additionally, observations from teacher informants add strength to a researcher's in-class observational notes, "enabling objectivity" (Sabar, 1998, p. 378), while simultaneously offering a distinct insider perspective on the learners' interactions with the RWT.

Section 3.4. Materials

Research Writing Tutor

The most indispensable material in this dissertation study is the RWT. The RWT is a web-based AWE tool developed to help train budding researchers, NNSs and NSs and undergraduate and graduate students alike, to recognize and apply normative patterns of writing in the academic RA genre (Cotos, Gilbert, & Link, 2012). The tool provides users with formative feedback designed to be used as a supplement to, not substitution for, formal academic writing instruction (Cotos, 2010). The feedback provided to RWT users concentrates on the communicative effectiveness of the discourse in the students' RA section drafts and helps the users to adopt writing norms common of the RA genre in their discipline (Cotos & Huffman, 2013). The RA section draft's communicative effectiveness is analyzed according to a move/step framework for each RA section and a comparison of how the author's text adheres to the writing norms of the student's discipline based on a cross-analysis with a corpus of published RAs in 30 academic fields (Cotos & Huffman, 2013; Cotos, Huffman, & Link, forthcoming; Swales, 2004).

The RWT is a scaled-up version of an earlier AWE program called IADE, or the Intelligent Academic Discourse Evaluator, developed by Cotos (2009) to provide rhetorically based feedback on students' Introduction section drafts. Like the RWT, IADE generated color-coded feedback based on students' deployment of rhetorical moves and steps in their written texts, and this feedback was also based on a cross-analysis of the students' texts with previously analyzed human– annotated Introduction sections from published research in academic disciplines throughout the university. The RWT exemplifies not only a more broadly applicable tool in the analysis of various sections of the RA, but is also more sophisticated than IADE in terms of its heightened capabilities and more extensive corpus of pre-annotated texts on which to train and from which to draw in providing examples to users (Cotos, 2011).

There are two modules of the RWT tool: the Analysis Module and the Demonstration Module. In the Analysis Module, students may submit a written draft of any section of the RA, and the tool provides immediate written and visual feedback identifying how well the user's text achieves the rhetorical functions common of that section in published RAs in their discipline. The feedback, based on a cross-analysis of the submitted text to a database of annotated texts in the designated discipline, is returned to in color-coded form (see Figure 3.4-1). The colors signal the rhetorical move the RWT recognizes the author accomplishing.

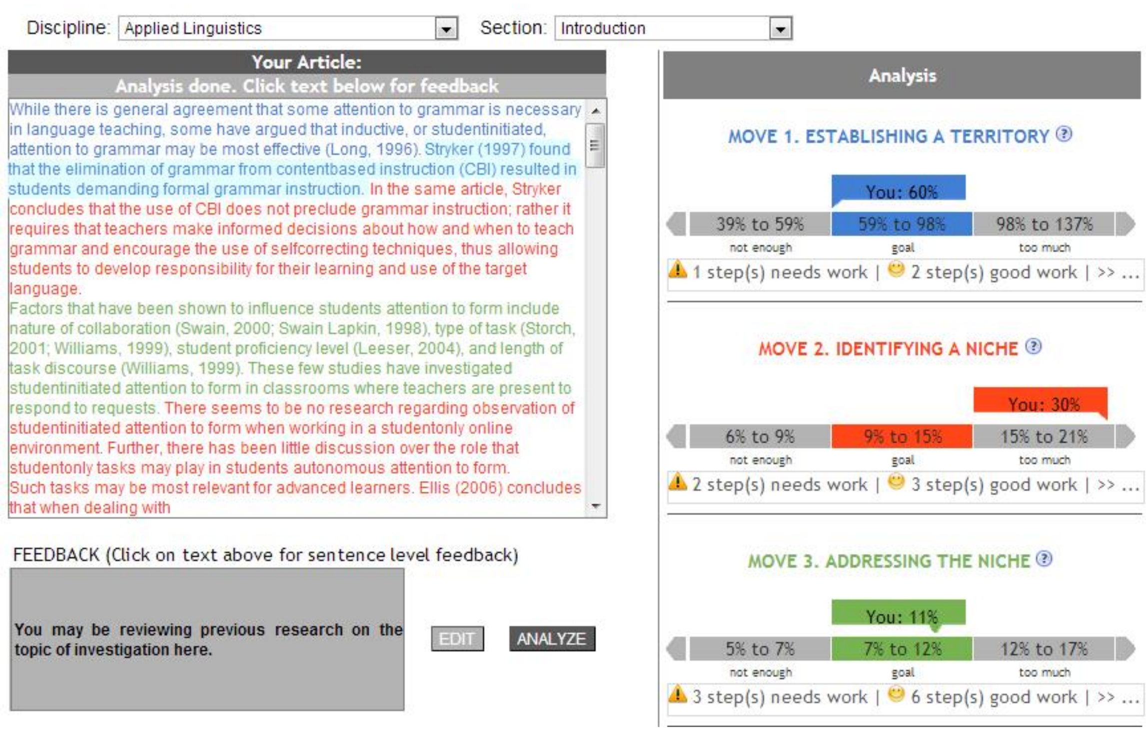


Figure 3.4-1. RWT Analysis Module's color-coded feedback on student draft

By clicking on an analyzed sentence in the text editor box (on the left of the Analysis Module screen), students are shown the rhetorical function of each sentence. A range bar next to the color-coded text displays a visual indication of how the author's use of rhetorical functions compares to how the communicative strategies, or "steps," are achieved by published authors in that discipline. A drop-down menu provides more detailed feedback about the specific areas for improvement in certain moves and steps (see Figure 3.4-2).

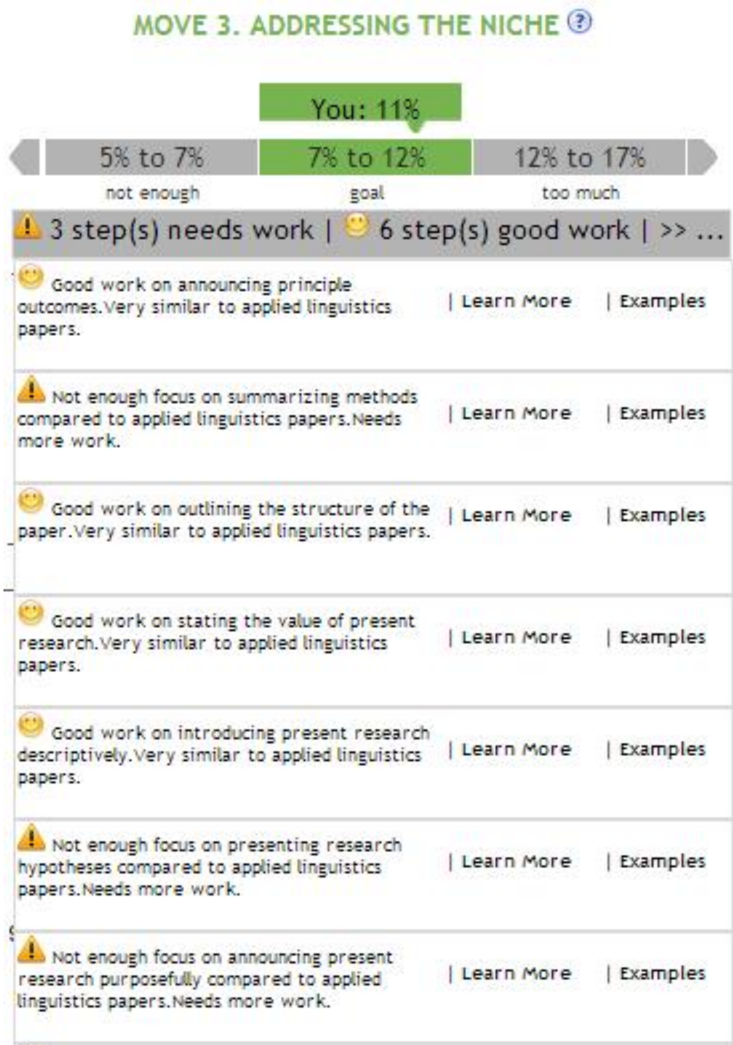


Figure 3.4-2. RWT Analysis Module's move and step-specific feedback on areas to improve

Another important feature in the Analysis Module is the option to modify and reanalyze submitted drafts. By clicking the “Edit” button, students may make revisions to their submitted texts based on the feedback given by the RWT analyzer. Additional features of the Analysis Module include the ability to explore step definitions and examples, compare an analyzed text’s word count to average word counts of other published RA sections in the discipline, and see a visual display of move distribution in the user’s writing and move distribution in section texts from published authors in the discipline.

The Demonstration Module of the RWT (see Figure 3.4-3) is accessible by clicking on an “Examples” link in the Analysis Module. The Demonstration Module allows students to access examples of moves and steps in articles in their disciplines so users may distinguish how published authors employ the rhetorical strategies in their writing.

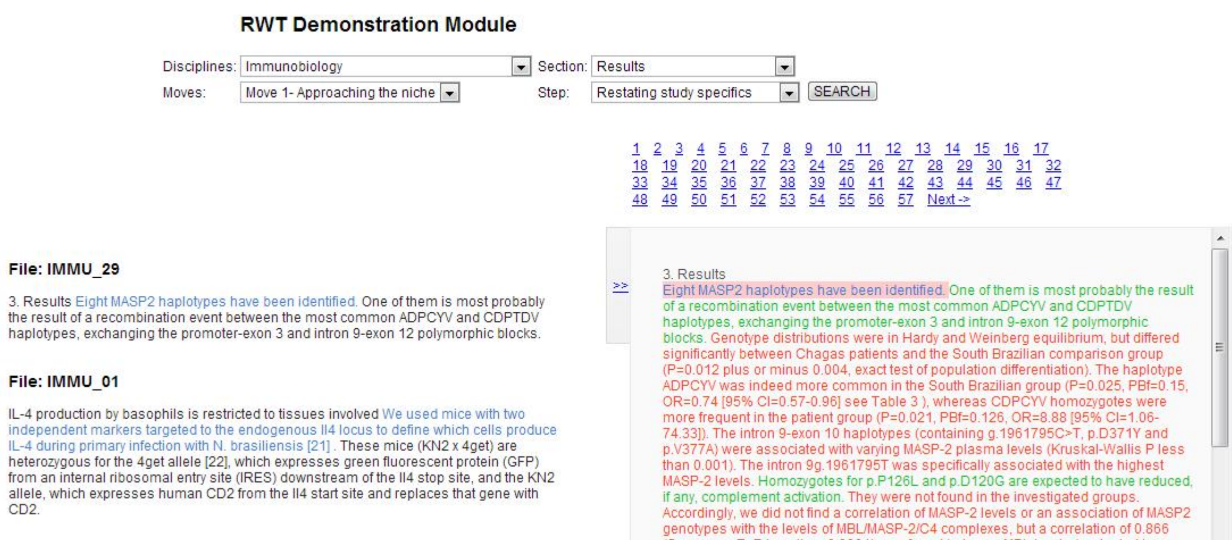


Figure 3.4-3. RWT Demonstration Module’s display of move and step examples

This AWE program differs from other AWE tools in a number of ways. Compared to other AWE software, such as Criterion Online Writing Evaluation Service, a web-based AWE tool produced by Educational Testing Services, the RWT feedback is not intended to be “diagnostic,” as Criterion’s feedback is, but instead aims at getting students to rethink the rhetorical intentions of their writing in the research writing genre. RWT feedback also is unique in that it does not highlight grammatical or syntactic errors in student writing, as programs such as Criterion do, but rather directs students to consider how the functional aspects of their written text compare to those produced by published authors in their disciplines. Furthermore, the feedback provided by RWT is all-encompassing, visually displaying not only students’ incorporation of moves and steps in certain sections of the RA, but also displaying published authors’ use of the same moves and steps, thereby allowing for a direct comparison of normative patterns and rhetorical function usage in published research versus a students’ own drafts.

Updates to the RWT since pilot study. There are notable differences in state of the RWT at the time of this dissertation and the state of the tool at the time the pilot study was conducted. One major difference pertains to the accuracy of the feedback. At the time of the pilot study, the RWT analyzer was still in a preliminary stage of development; the feedback at that time was inaccurate and inconsistent. In the time between pilot study data collection and dissertation data collection, the Analysis Module was developed a great deal to produce more reliable feedback of enhanced accuracy. That the RWT was still in an early phase of development at the time of the pilot study was a factor that may have interfered with answering the research questions about students’ perceived usefulness of and trust in the tool as well as how students interacted with the tool. It was clear from the pilot study that students focused on the RWT feedback accuracy in their discussions trust in and usefulness of the tool and the provided feedback. It therefore seems reasonable to project that perceptions of the tool may change or develop as the tool developed, and it was important to examine these perceptions and interactions with the newly improved version of the Research Writing Tutor.

Another improvement to the tool from the pilot to dissertation study is the expansion of the Analysis Module to analyze all sections of the RA. At the time of the pilot study, only the Introduction texts could be submitted and analyzed for feedback. However, after the pilot study, the RWT was developed further and capabilities were expanded so the RWT analyzer could perform analyses on the remaining sections of the RA. By time of the dissertation data collection the tool was able to analyze all RA section drafts: Introduction, Methods, Results, and Discussion/Conclusion. Though this dissertation research is chiefly interested in learners' initial draft analysis with the RWT, thus concentrates on the first interaction users have with the AWE tool in their analysis of Introduction section drafts, the RWT development is worthy of note for, unlike the situation presented in the pilot study, in this dissertation study context learners were aware they would be able to continue their use of the RWT for additional RA section draft revisions. Recognizing their capacity to use the RWT for future writing development may have impacted learners' interactions with or perceptions of the tool and is therefore worth mentioning.

A final difference in the state of the RWT from the pilot to dissertation research is the functional Demonstration Module. During data collection for the pilot study, the Demonstration Module had not yet been developed, so participants did not have access to the examples of steps utilized by authors in their respective disciplines. At the time of the dissertation data collection, the Demonstration Module was fully functional, providing examples for steps and moves accomplished in every section of the RA by discipline.

Screen Capturing and Audio Recording Tools

Students' interactions with the RWT were recorded using Apple Inc's QuickTime version 10 (2009), a screen capturing tool allowing users to easily record their on-screen interactions. Audacity, an open source audio recording program, was used to record participants' stimulated recalls and the post-task interview with the course instructor.

Pre-Task Questionnaire

Prior to engaging in the analysis of their Introduction drafts using the RWT, participants were asked to complete a pre-task questionnaire using the online survey system Qualtrics (2012). The pre-task questionnaire gathered learner demographic information as well as assisted in establishing a baseline of students' prior experience using technology. The questionnaire primarily included cloze items with a few open-ended response items, and collected both quantitative and qualitative data. See Appendix A for the full pre-task questionnaire.

The questionnaire items were adapted from questionnaires administered by previous researchers (Compeau & Higgins, 1995; Oliver & Towers, 2000; Rimrott & Heift, 2005; Shi et al., 2004) who sought to identify students' levels of comfort using technology, familiarity with computers, and technological literacy in self-report format. The format and structure for many of the items on the pre-task questionnaire pertaining to learners' current level of efficacy using technology were derived from Computer Self-Efficacy Scale (CSES), a measure commonly used in human– computer interaction research to gather users' self-reported judgments about their own capabilities to use technology, old and new (Compeau & Higgins, 1995). The CSES, a 32-item scale developed by Murphy, Coover, and Owen (1989), was initially created to measure subjects' perceptions of their own accomplishments relevant to computer-specific knowledge or skills. This particular scale was selected to provide a framework for approaching the pre-task questionnaire, because the CSE elicits similar data as was needed to answer the research questions regarding learners' comfort level using familiar and new technology. Standards outlined by the International Organization for Standardization (2006) on effectiveness and usability (ISO 9241) were also consulted when creating the pre-task questionnaire. ISO 9241 contains a number of sub-standards pertaining to features of use and experience in human– computer interaction. ISO 9241's considerations for usability (such as who are the users, what do they know, what is their context for working, etc.) were of particular interest in this study, as these considerations allowed the researcher to ascertain users' basic demographic information (age, first language, discipline) and prior experience with and expertise using computer-based tools.

Post-task Survey

Immediately following participants' self-analysis of the Introduction drafts with the RWT, a computer-based post-task survey was administered via the online survey system Qualtrics (2012). The survey included mostly four-point Likert-scale items with five open-ended short-answer questions at the end. The full survey is available in Appendix B.

Survey questions elicited learner perceptions of the usefulness of, trust in, and degree of control they felt when interacting with the Research Writing Tutor. These items were modeled after those used in surveys by previous researchers who investigated the perceived effectiveness of AWE tools (Cotos, 2011; Page, 2003; Warschauer & Ware, 2006). The final two open-ended questions on the post-task survey gathered information about the features of the tool participants found most beneficial and what recommendations they had for improving the RWT.

To complement the user interaction data, Likert-scale items asking about the tool's functionality, access and ease of use, learner satisfaction, and if the RWT met learner expectations were included to capture a more complete picture of users' experience with the RWT (Cotos, 2011; Nix & Wylie, 2011). The questions also incorporated considerations based on ISO standard 9241 (2006) involving effectiveness and usability of computer-based tools in human– computer interaction.

Section 3.5. Procedures

Prior to initiating study procedures, approval was sought and obtained by the university's Institutional Review Board to assure consent was obtained and procedures were conducted according to university standards. Because this study investigates students' use of a tool already part of the course curriculum, collection of learner perception and user-tool interaction data required minimal intervention on behalf of the researcher. Apart from one out-of-class meeting with students for stimulated recalls and the interview with the class instructor, all procedures involving in data collection took place during participants' regularly scheduled class hours. Figure 3.5-1 outlines the procedural stages which were part of the students' planned program of study. The second and third weeks of the academic course comprised an instructional phase in which students learned the rhetorical moves and steps appearing commonly in Introduction sections in published RAs, as outlined by Swales (1990, 2004). The instruction entailed an introduction of the Swalesian move/step schema, familiarization with the schema through step and move recognition activities, and interaction with a corpus of pre-annotated Introduction sections from published RAs in the students' respective disciplines of study. At the end of this instructional phase, students were expected to apply the schema as they composed an initial draft of an Introduction section and engaged in peer-review of their classmates' drafts.

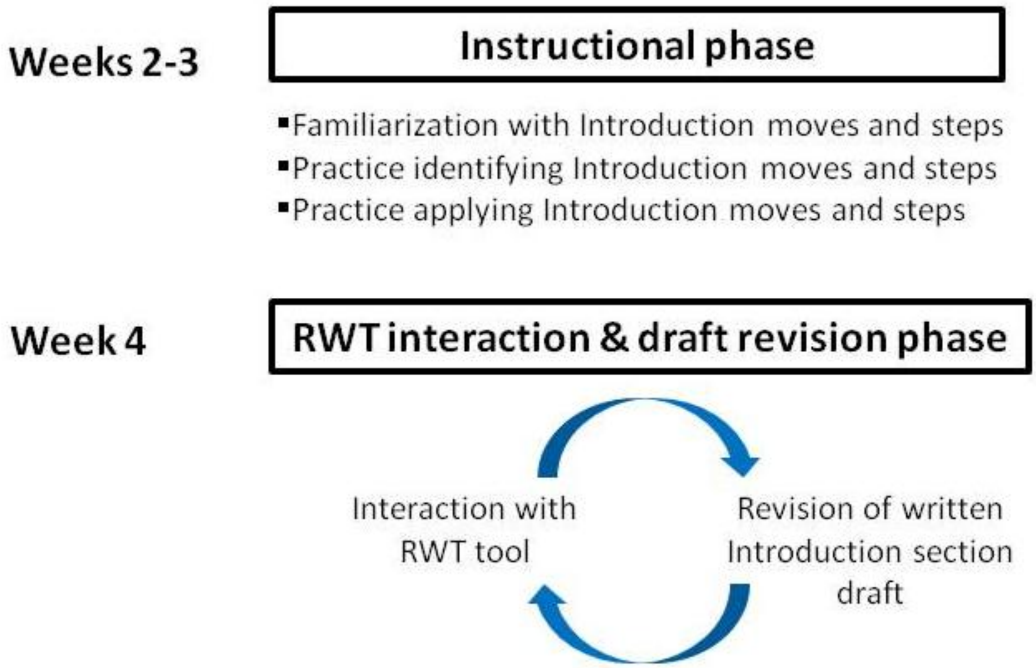


Figure 3.5-1. Procedural stages preparing students for RWT analysis

In the fourth week of the course, the instructor introduced the Research Writing Tutor. In preparation for interaction with the RWT, students were asked to bring to class an electronic version of their Introduction section draft. The instructor first explained the RWT's purpose, capabilities, functions, and limitations. The learners then engaged in a self-analysis of their own Introduction section drafts using the RWT, involving submitting the draft for automated analysis and making revisions to the text based on the formative feedback. The teacher notified students that they could modify their drafts and re-submit them to the RWT for updated feedback, then continue with further revisions. This cyclic process of students engaging in a receipt of feedback and modification of drafts lasted for the remaining one hour of class.

Section 3.6. Data Collection

Figure 3.6-1 summarizes data collection procedures on the day of and days following participants' in-class interaction with the RWT tool.

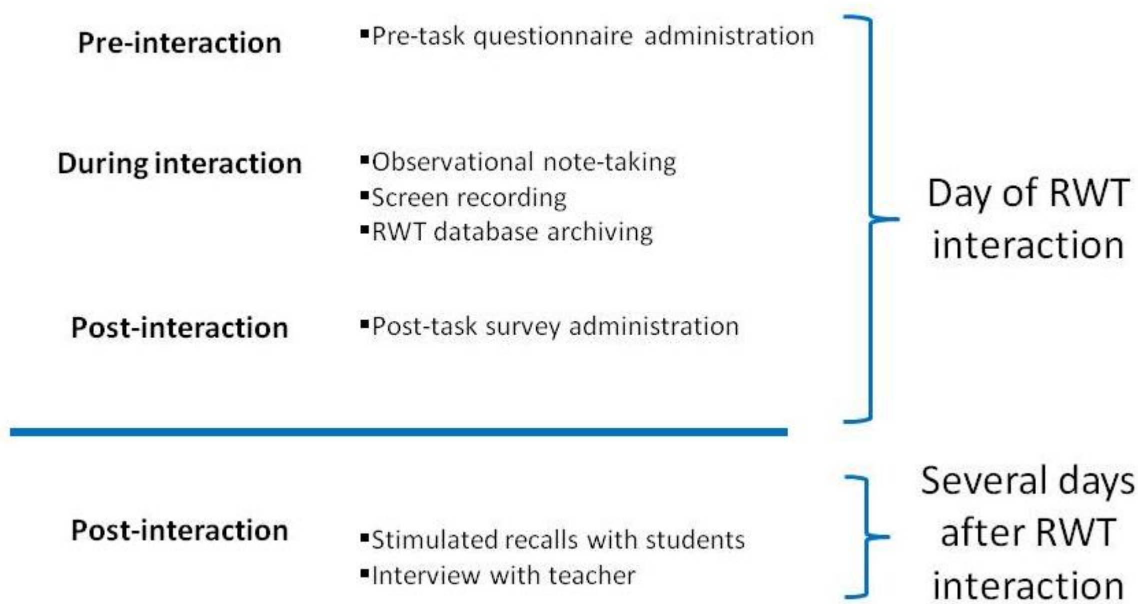


Figure 3.6-1. Data collection procedures

Data were collected starting the day of students' interaction with the RWT. Immediately preceding students' interaction with the tool, students were asked to complete a pre-task questionnaire administered through the online survey management system Qualtrics (2012). The questionnaire took approximately ten minutes for students to complete. As students analyzed their texts using the RWT, their on-screen interactions were recorded using the screen recording software available with Apple QuickTime (2010). Also, as students interact with the RWT, users' behaviors (such as clicks on and hovers over the tool's features, the number of submitted drafts and quantity and details of revisions made to the drafts) were concurrently stored in the RWT's database.

The researcher also observed the class and took notes on her observations during participants' self-analysis of their Introduction drafts using the RWT. Observational protocol involved taking notes on the "events, behaviors, and artifacts in the social setting" in the classroom where the study was conducted (Marshall & Rossman, 1989, p. 79). Observational notetaking guidelines outlined by Gass and Mackey (2007) were followed to capture a rich description of the context for the RWT interaction and participants' off-screen behaviors, which were unable to be captured by the screen recording software. Specifically, observations and notes centered on learners' observable behaviors, such as asking the instructor for assistance, collaborating with classmates, or displaying negative or positive verbal or nonverbal reactions when using the tool.

Finally, following students' draft analysis with the RWT, a post-task survey was administered in class via Qualtrics (2012). The survey took approximately ten minutes for students to complete.

Several days following students' in-class interaction with the RWT, participants were contacted about meeting one-on-one with the researcher to review their screen captures and conduct a stimulated recall. The stimulated recall is an introspective data collection strategy which allows for researchers to access participants' thoughts as the learners engage in a task (Gass & Mackey, 2007). It requires presenting participants with a stimulus (in this study, the video screen capture showing the student's onscreen interaction with the RWT) and asking them to reflect on their thought processes and/or areas of focus at the time of the interactions (Lewis, 1982). Prior to conducting each stimulated recall session in this study, each screen capture recording was previewed, and noteworthy features were observed and documented so the one-on-one meetings would be more time efficient. The length of stimulated recall sessions ranged from 15-30 minutes, depending on the level of description the participant volunteered when shown the prompts. Each session was audio recorded for later transcription.

Lastly, an unstructured interview with the course instructor was conducted days following the students' in-class use of the RWT. The unstructured interview allowed the researcher to gain unscripted, conversational data on students' behaviors using and reactions to the RWT (Mackey & Gass, 2007). Impromptu, open-ended questions regarding students' interactions with the RWT, including any perceptions/questions/concerns voiced to the instructor, behaviors observed, or collaboration taking place were raised. The instructor also was given time to discuss what further aspects of students' RWT interactions she found worthy of mention. Like the stimulated recalls, the instructor interview was audio recorded for transcription purposes.

Section 3.7. Data

In response to Cotos' (2011) call for richer data sources to provide "more in-depth perceptions and more genuine reactions" to AWE tools (p. 444), numerous forms of data were collected from a range of data sources. Table 3.7-1 provides a summary of the data as well as the type and form of the data and specification of from where the data derived. The following several subsections provide necessary details as to exactly how the audio, video, written, and spoken data were collected to add dimension to the data and to more thoroughly address each of the research questions in this dissertation.

Learner Demographic Data

Learner demographic data were collected in a pre-task questionnaire administered to students prior to their in-class interactions with the RWT. The demographic data included

Table 3.7-1.

Detailed Summary of Data Collected

Data Category	**Data**	**Data Type**
Learner demographic	▪ Pre-task questionnaire responses to cloze and open-ended response items	▪ Quantitative / Qualitative
User interaction	▪ Researcher's observational notes ▪ Screen recordings of students' RWT interactions ▪ Learners' in-process written feedback to RWT ▪ Post-task interview responses from teacher informant ▪ RWT database frequency tallies of clicks/hovers on site features	▪ Qualitative ▪ Qualitative ▪ Qualitative ▪ Qualitative ▪ Quantitative
Learner perception	▪ Post-task survey responses to Likert-scale and open-ended response items	▪ Quantitative / Qualitative
Introspective	▪ Stimulated recalls	▪ Qualitative

information about each learner's age, gender, year in a PhD or Masters program, discipline of study, status as a non-native or native speaker of English, and background experience using computer-based language learning resources and AWE software. This data was beneficial for answering RQ3 about how learners perceive their previous experience with technology, computer-based language learning resources, and AWE tools as affecting their interaction with the RWT. As Oliver and Towers (2000) and Shi et al. (2008) argue, learner demographic data helps to establish a baseline of the participants' familiarity with and previous use of technology for language learning purposes. Likewise, understanding users' comfort level with technology helps researchers understand just how users interact with new technological tools (Heift & Rimrott, 2007). These data were mainly qualitative, but some responses (e.g., age, years of study in program) were numerical.

User Interaction Data

Using methods similar to those employed by Pujola (2002) and Nix and Wylie (2011), multiple forms of user interaction data were collected to answer RQ2a-b about how users interact with the RWT. In terms of capturing students' on-screen behaviors, two types of data were collected. During participants' interaction with the RWT, users' on-screen interactions were captured using Apple QuickTime. Each screen capture video lasted no more than 50 minutes, the length of the learners' interactions with the tool. The videos were later reviewed to determine what, how, and when users explored certain features of the RWT during this initial interaction with the tool. Because mouse movements and eye movements have been shown to correlate, and eye movement is an indication of cognitive interest in and attention to an item (Chen, Anderson, & Sohn, 2001; ComScore Inc. & Pretarget, 2012), screen capture videos showing students' mouse movements permitted the researcher to examine elements of the tool which revealed varying degrees of student interest.

Also, as users interacted with the RWT, engagement with certain RWT elements was automatically stored in the tool's database. These data included frequency tallies of clicks on particular features of the tool (such as pie charts), text submissions for analysis, access of the Demonstration Module page, and the thumbs up/thumbs down/neutral feedback the student gave to the RWT based on the Analysis Module's sentence-level feedback. The user interaction data provided from the database were entirely quantitative, nicely supplementing the qualitative screen recording data and generating an exhaustive account of each learner's interaction with the RWT.

Additionally, observational notes were taken by the researcher during students' in-class interaction with the RWT, based on recommendations by Pujola (2002). The researcher's non-participant observation afforded thick descriptive data (Geertz, 1973) which were unable to be acquired through surveys, RWT database archives, or screen recordings. These notes included first account information about participants' interactive behaviors with the RWT, including the students' perceptible levels of enjoyment of or frustration with the tool, how often and which participants asked for the instructor's assistance, if students collaborated to help one another understand the tool's functionality, and the discernible degree of engagement with the tool and the task. These observational notes were largely qualitative, though some quantitative data emerged in the form of frequency counts of observable behaviors.

User interaction data were also gathered through an unstructured interview conducted with the course instructor after students' self-analysis of their Introduction texts with the RWT. Unstructured interviews hold the advantage of allowing a greater amount of breadth than any other interviewing style, as they are not restricted to a pre-set, fixed set of questions guiding the direction of the discussion (Fontana & Frey, 1994). Also, integrating the teacher's observations added an integral non-researcher perspective necessary to gaining a more holistic interpretation of students' interactions with the RWT. Because the instructor had established relationships with the students over the first few weeks of the semester, the teacher's perspective offered valuable insights into specific student behaviors, learning styles, patterns, or strategies which may have been inaccessible or unknown to the researcher.

In order to analyze the interview data in a systematic way, the audio recording of the unstructured interview with the instructor had to be transcribed to written text. Transcription of the audio was accomplished by a professional transcriber. The researcher then transcribed a portion of this data to establish inter-transcriber reliability, or consistency in the transcriptions. Though some second language research scholars have yet to describe the importance of calculating inter-transcriber reliability, in their discussion of establishing inter-*coder* reliability, Mackey and Gass (2011) advise a subset of qualitative data be coded by more than one coder to ensure "transparency, logic, and clarity of themes" (p. 107). Because this researcher sought the same type of consistency in the transcriptions, Mackey and Gass's notion was applied to the current study to confirm precision and clarity of the professionally transcribed data.

Since precisely how to calculate inter-transcriber reliability has not been specified among qualitative researchers in the field (nor other explored social science fields), decisions related to establishing inter-transcriber reliability followed suggestions outlined by Mackey and Gass (2005) for working with continuous data (wherein data units are limited in precision and could hypothetically take on any value within a potential range). The authors maintain that using simple percentages to calculate inter-coder agreement is sufficient when coding continuous data. Calculating simple percentage agreement involved determining the ratio of all coding agreements, transcription agreements in this case, over the total number of coding (transcription) decisions made (Mackey & Gass, 2005). First, ten percent of the transcribed data was selected for calculating simple percentage agreement, because, as Mackey and Gass (2005) note, with highly objective low-inference coding schemes, that is all which is required to establish rater reliability. Based on inter-coder reliability recommendations by Ortega (2000), *which* ten percent of the data to be transcribed was chosen based on a stratified random sampling technique, in which data are chosen in a way that ensures all participants, tasks, and coding units are selected in a proportional way which corresponds to the main data set. Selecting the ten percent of audio data to be double transcribed by the researcher involved first determining the length of the overall audio recording, dividing this number by ten, and transcribing ten percent of the overall recording down to the minute and second. The researcher started transcribing the ten percent sample at minute 5:00 in the interview recording to guarantee the interview was well under way at the time of the recording and so as to avoid non-content oriented greetings, description of instructions, or clarifications about the purpose or goal of the interview. Once the subsample to be double transcribed was selected, the total number of agreements was tallied and divided by the total number of transcribed units. Disagreement (calculated by deducting on full numerical value —1.0 —from the total number of transcribed units) was considered instances in the professional transcriber's transcript and the researcher's transcript where entirely different lexical units were recorded or a lexical item was not recorded at all, as in "makes it" and "makes it up" (from stimulated recall transcript for Participant 10). Half-disagreement (calculated by deducting half a numerical value—0.5 —from the total number of transcribed units) was marked in instances in which both transcribers captured the root word, but perhaps recorded different word endings , as in "introduce" versus "introduced" (from stimulated recall transcript for Participant 3). In line with foundational interactional research (Oliver, 1995), the inter-transcriber reliability is represented as the percentage of agreement between the transcribers. The simple inter-transcriber agreement for the interview data was calculated to be 99.09%, which represents near perfect agreement among the transcriptions provided by the two transcribers (Mackey & Gass, 2005). Adhering to recommendations by Mackey and Gass (2011), inter-transcriber agreement was calculated early on in the transcription process so as to reduce errors that could be potentially be costly in terms of time and money.

Learner Perception Data

Learner perception data were collected by means of an online, post-task survey administered directly after students' draft revision with the RWT. Survey questions elicited quantitative data through four-point Likert-scale items and qualitative data through open-ended items, and were used to answer RQ1a-c about perceived usefulness of, trust in, and control felt using the RWT and to answer RQ2b about use of strategies when using the RWT. Questions gathered learners' perceived usefulness of and trust in the RWT, ease of use of the tool, and the degree of control learners had when using the RWT. To reduce bias, questions were composed as both positively and negatively worded statements, so that participants were provided both agreement and disagreement options (see Gass & Mackey, 2007). The questioned concepts were chosen on the basis of previous language learning researchers' study of students' perceived helpfulness and effectiveness of AWE tools (Cotos, 2010; Warschauer & Grimes, 2008; Warschauer & Ware, 2006).

Introspective Data

To better understand students' perceptions of their interactions with the computer-based language learning tool (Ericsson & Simon, 1987; Pujola, 2002), stimulated recalls were be conducted with each of the participants. Stimulated recall data were particularly valuable to this study in that they permitted unique access to participants' cognitive processes during the recorded RWT interaction (Fox-Turnbull, 2011). These data were qualitative, and were particularly useful in answering RQ2b about the strategies used during students' RWT interactions. As with the audio recordings from the interview, audio from the stimulated recalls were transcribed by a professional transcriptionist.

Similar to what was accomplished for processing the audio data from the instructor interview, simple percentage agreement was calculated on a subset (ten percent) of the stimulated recall data to establish inter-transcriber reliability. Ortega's (2000) stratified random sampling techniques were employed for double transcribing the stimulated recall audio as well. Because each participant's stimulated recall was conducted at a different time and stored as a separate audio file, selecting the audio to be transcribed involved dividing the total length of time for each recall by ten and transcribing that precise amount of audio data down to the second. Double transcribing a portion of data from each participant aided fair consideration of the audio from all participants, important for establishing consistency of the transcriptions for recordings of NNS and NS speech alike. Also similar to the interview audio transcription, the researcher began double transcribing at minute 5:00, a time when all recalls were sufficiently in progress, and concentrated on learners' thought processes when interacting with the RWT. Simple percentage agreement among the two transcribers of the eleven participants' stimulated recall transcripts ranged from 90.36 percent to 99.56 percent, with an average of 96.92 percent and a median of 98.02%. According to Mackey and Gass (2005), who maintain that inter-coder reliability calculations above 75 percent can be deemed "good," and 90 percent agreement or higher is "ideal" (p. 244), these simple percentage agreements among the two transcribers can be considered "ideal." Inter-transcriber simple percentage agreement calculations for individual participants' transcripts can be found in Appendix C.

Section 3.8. Data Analysis

The following details the specific data analyses that were carried out to answer each of the research questions, and is organized by research question. Summaries of the data used to answer each question and accompanying descriptions of the data analysis are provided for each research question in a corresponding table. It should be noted that RQ1a-c received intentional emphases in the overall data analysis (evidenced in both breadth and depth of

RQ1a-c: Learner perceptions of the RWT

Table 3.8-1.

Data Analyses Used for Answering RQ1a-c

RQ addressed	***Perception & introspective data***	***Analytical technique***
RQ1a: *How do learners perceive the usefulness of the RWT tool?*	Likert-scale responses on post-task survey Open-ended responses on post-task survey Transcripts of stimulated recalls	Descriptive statistics (QUANT) SFL analysis of *appreciation, engagement, graduation*, & *affect* resources (QUAL & QUANT) SFL analysis of *appreciation, engagement, graduation*, & *affect* resources (QUAL & QUANT)
RQ1b: *To what degree do learners trust the RWT tool?*	Likert-scale responses on post-task survey Open-ended responses on post-task survey Transcripts of stimulated recalls	Descriptive statistics (QUANT) SFL analysis of *appreciation, graduation*, & *affect* resources (QUAL & QUANT) SFL analysis of *appreciation, engagement, graduation*, & *affect* resources (QUAL & QUANT)
RQ1c: *What degree of control do learners perceive they have when using the RWT?*	Likert-scale responses on post-task survey Open-ended responses on post-task survey Transcripts of stimulated recalls	Descriptive statistics (QUANT) SFL analysis of *appreciation,* & *graduation* resources (QUAL & QUANT) SFL analysis of *appreciation, engagement,* & *graduation* resources (QUAL & QUANT)

analytic techniques employed and triangulation of findings), as these research questions served as the primary research questions guiding the dissertation study.

RQ1a: How do learners perceive the usefulness of the RWT tool?

To analyze how learners perceive the usefulness of the RWT, quantitative and qualitative data analysis techniques were employed. Quantitative analyses of students' Likert-scale responses to questions about perceived usefulness of the RWT followed procedures outlined by Cotos (2011) and Grimes and Warschauer (2010). Preparing the quantitative data from participants' Likert-scale responses on the post-task survey first involved arranging all item responses in order wherein "1" signified the most disagreement and "4" signified the most agreement with a statement. Descriptive statistics of the Likert-scale items were calculated to compile an overall picture of the class's perceived usefulness of the RWT.

To analyze the qualitative data regarding usefulness of the RWT, a systemic functional analysis was conducted on participants' responses to open-ended questions on the post-task survey and transcripts from the stimulated recalls. As articulated in Chapter 1, an SFL on language, which positions language as content and as a resource for meaning making (Halliday, 1994; Mohan, 1986), was applied to explore the learner perception data, because of its anticipated capacity to provide meaningful insights into participants' perceptions of their RWT experience as the experience is socioculturally situated. The functional investigations of learner language, situating texts in the contexts of their social practice, targeted sentences in learner discourse as the elemental units of analysis (Halliday & Martin, 1993). A functional analysis of participants' discourse was chosen to analyze the learner perception data, as it allowed the primary investigator to uncover shades of meaning in learner evaluations of their RWT experience.

More specifically, a systemic functional analysis of the interpersonal metafunction, conducted through an investigation of students' use of Appraisal resources, was carried out to systematically examine students' reflections on their RWT interactions. The interpersonal metafunction attempts to describe the relationship between speakers and their audiences by getting at how speakers express opinions and attitudes with language and how these expressions are framed against a background of external voices (Li, 2001). Analyses of interpersonal metafunction resources help researchers understand how speakers convey social relationships, interact, engage, or disengage with an audience, and position themselves and their opinions in the greater context of the social world through the choices they make in language.

To answer RQ1a on the perceived usefulness of the RWT, an SFL analysis of Appraisal resources was conducted on learners' open-ended responses and transcripts of the stimulated recalls. Specifically, the analysis involved close examination of participants' language of *appreciation, affect, engagement,* and *graduation* linguistic resource systems deriving from the APPRAISAL Network (Martin, 2003; Martin & Rose, 2003; Martin & White, 2005), a functional framework that describes a system of lexicogrammatical resources writers/speakers use to realize interpersonal meaning in a text. Appraisal, a semantic category realized explicitly or implicitly through language, is essentially concerned with evaluation: "the kinds of attitudes that are negotiated in a text, the strength of the feelings involved and the ways in which values are sourced and readers aligned" (Martin & Rose, 2003, p. 22). The APPRAISAL Network (see Figure 3.8-1) describes a taxonomy of the language used for evaluation to convey *attitude* [emotions (*affect*), judgments of people and evaluation (*appreciation*) of objects or events], *engagement* (assessment of the evaluations of other people), and *graduation* (modifications to the strength of *attitude* and *engagement*). In particular, an Appraisal analysis considers speakers' use of the lexicogrammar such as evaluative lexis, modal verbs, modal adjuncts, polarity, numeration, intensification, repetition, manner or extent, logico-semantics and vocation (Martin & White, 2005), and permits researchers to explore "how choice of lexis can 'colour' representations of experience" (Unsworth, 2000, p. 270).

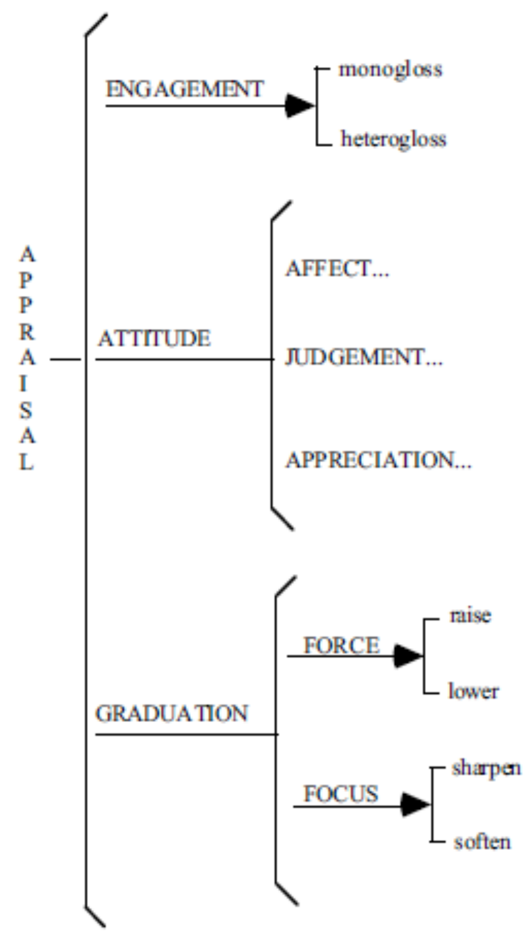


Figure 3.8-1. Martin (2004) & Martin & Rose's (2003) APPRAISAL Network

Because each RQ in the first RQ set is concerned with how learners perceive their experience with the RWT, the Appraisal category of *attitude* was of particular interest in this study. Of predominant interest is the language that participants use for evaluating the quality or worth of things or processes, what Martin (2004) and Martin and Rose (2003) term *appreciation.* What is being valued, or *appreciated,* may include natural and semiotic (products or processes) phenomena. The *appreciation* itself may involve a speaker's reaction to, valuation of, or assessment of the composition of the assessed object or process, and is charged by the speakers in a positive or negative way. Martin and White (2005) provide extensive examples of both positively and negatively charged *appreciation* resources to illustrate the differences between the two. Positive *appreciation* may be, for instance, conveyed through the use of such adjectives and adverbs like *profoundly, elegant, consistent, beautifully, remarkable, notable, exciting, rich, detailed* or *welcome*, while negative *appreciation* could be construed through similar lexicogrammar such as *dull, unclear, untimely, useless, insignificant, poorly, confusing, ugly, monotonous,* or *distorted.* In terms of this dissertation research, conducting a lexicogrammatical analysis of the *appreciation* resources participants used when discussing their experience with the RWT enabled a means of systematically identifying concrete instances of evaluation of the RWT and learners' experience using the RWT through an investigation of the evaluative language in participants' discourse. In answering RQ1a, the *appreciation* resource analysis focused on learners' evaluation of the RWT and their RWT interactions in terms of the usefulness of the tool and the draft revision process using the tool.

Though the proposed plan for the data analysis did not originally include Appraisal analyses beyond an *appreciation* resource analysis, it was decided early on in the qualitative analysis that further systemic functional analyses part of the APPRAISAL Network would be helpful in illuminating further aspects of learners' evaluations of the usefulness of the RWT as well as enable a systematic means of identifying and interpreting the perception data. In particular, analyses of learners' use of *engagement, graduation,* and *affect* resources were conducted to attend to the ways in which learners engaged in discussion about the AWE tool and their experience using the tool, scaled their evaluations of the RWT and their RWT interactions, and conveyed emotional reactions to their use of the RWT.

An analysis of *engagement* resources was conducted to better understand how tentative participants' claims were in their appraisal of the RWT's usefulness.[1] *Engagement* pertains to the lexicogrammatical resources used to "indicate the speaker's degree of commitment to the appraisal being expressed" (Martin, 2003, p. 142). In other words, *engagement* regards the "voice" or position of the speaker in the sourcing of attitudes and opinions. Martin (2003) and Martin and White's (2005) description of *engagement* builds from Stubbs' (1996) view that all utterances convey a point of view and thus, all texts are inherently dialogistic and encode interlocutors' reactions to their experiences.

The investigation of learners' alignment with their evaluative statements about the RWT required an exploitation of the *engagement* system put forth by Martin and White (2005). The *engagement* system brings together a number of previously researched areas on intersubjective stance, such as modality (Palmer 1986), polarity (Pagano 1994), evidentiality (Chafe &Nichols 1986), hedging and boosting (Markkanen & Schröder 1997; Hyland 1996;

[1] An analysis of *engagement* resources was conducted for RQ1a and not for RQ1b and RQ1c, because RQ1a is the primary research question guiding the analysis of learner perceptions; the examination of *engagement* resources used for answering RQ1a served as a supplementary analysis to the *appreciation* resource analysis to gain further insights into learners' investment in evaluations of the RWT's usefulness. These analyses were deemed less essential for RQ1b and RQ1c, secondary RQs targeting learner perceptions of the RWT and their RWT experience.

Meyer 1997), vague language (Channell 1994), intensification (Labov 1984), and meta-discourse (Crismore 1989), in recognition that all these resources provide the grounds for an interlocutor's engagement with propositions and proposals.

According to Martin and White (2005), the *engagement* system can be divided into monoglossic resources, where there is no recognition of dialogistic alternatives (appearing commonly in narratives and authorial voice-dominant texts) and heteroglossic resources, where there is recognition of dialogistic alternatives (referencing more the ways in which interlocutors directly encode recognition of other stakeholders in their expression of a clause). In heteroglossia, other voices are permitted to participate in a text through dialogic expansion, in which other alternative sources or voices are entertained or acknowledged, allowing the author to distance himself or herself from a claim (Martin, 2003). An example of monoglossia may be a statement such as "Think about how to improve this," while a heteroglossic statement may be "I suggest the RWT be improved by adding grammar help options." Notice how in the monoglossic example there is absolutely no room for a dialogistic alternative, while the heteroglossic text recognizes other voices through the utterance by entertaining the possibility of other potential suggestions for RWT improvement.

Authorial distancing or approximating through heteroglossic resource use can be done through what Martin and White (2005) call *expansion* and *contraction,* both of which are two main categories in the heteroglossic engagement system (see Figure 3.8-2). Language which expands a claim allows a consideration of alternative perspectives and is more suggestive than authoritative, whereas language which contracts the scope of a claim represents a more absolute assertion that leaves no room for uncertainty or question

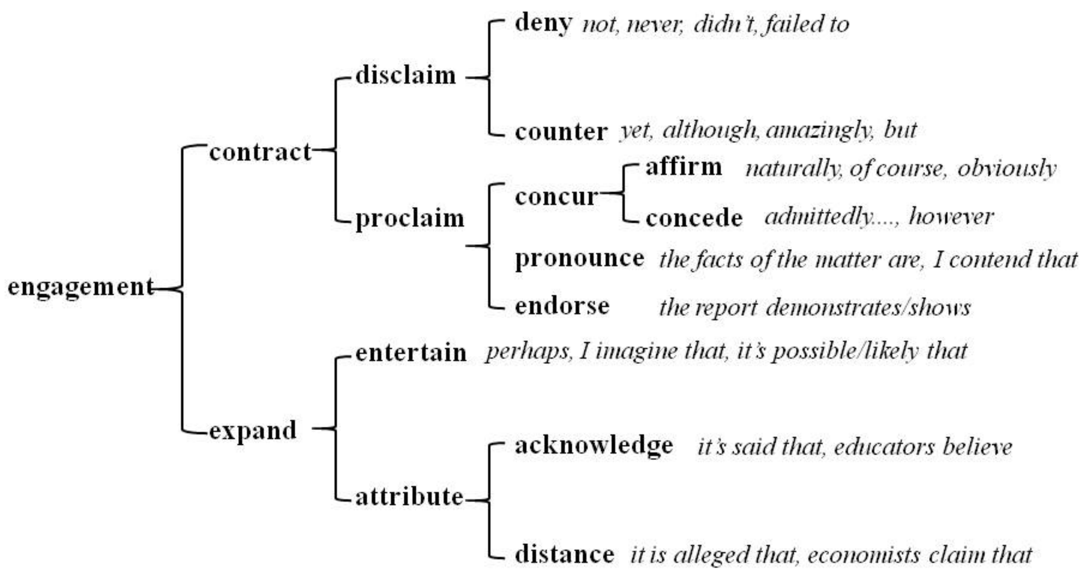


Figure 3.8-2. Martin and White's (2005) heteroglossic *engagement* network

and construes an authoritative stance towards a proposition. *Contraction* and *expansion* systems are extended to even more advanced delineations of authorial positioning. From *contraction,* the sub-classifications of *disclaim,* textual voice that rejects or counters a claim, and *proclaim,* language which endorses or concurs with a position and rules out all alternative positions, emerge. The subcategories *entertain,* voice that invokes dialogistic alternatives by presenting one of many possible positions, and *attribute,* text which entertains other propositions by grounding an utterance in explicit sources, stem from the *engagement* category of *expansion* (Martin, 2003). Detailed analyses of *engagement* resources used in a text help shed light on how authors may position their authorial voice to contract or expand, or align or disalign themselves with respect to a sentiment or proposition.

Because this dissertation studies students' perceptions of their interactions with the RWT and the tool itself, conducting an analysis of *engagement* resources helped to show how strongly students feel about their claims and how broadly they feel their opinions are shared. Authors commonly engage with their audience through use of modal auxiliaries, such as *may, might, could, will,* and *must,* modal adjuncts, like *perhaps, probably,* and *definitely,* modal attributes, such as *it's possible/likely that...,* circumstances, such as *in my opinion...,* and verb or attribute projections, like *I suspect that* or *I think/believe.* Thus, an *engagement* resource analysis through Martin and White's (2005) framework allowed consideration that through study participants' use of language like "potentially," "it seems like," obviously," "I think," or "it's possible" (all authentic examples derived from pilot study data), textual voice functions to recognize, engage, and align the author with assertions or propositions which could serve as potential alternatives to the text.

The APPRAISAL Network analysis further entailed an examination of the *graduation* resources, or lexicogrammatical resources interlocutors use to mark the force and focus of the opinions they express. *Graduation* refers to the language which functions to amplify or diminish a an author's expression of *attitude* and *engagement*, two closely linked semantic categories, in a text (Martin & White, 2005). Some examples of *graduation* resources are "a bit," "somewhat," "very," "really," or "kind of," and their presence in a text serves to scale up or scale down speakers' assertions, thereby modifying the strength of the evaluations speakers make.

Graduation resources have conventionally been studied under an array of labels, including "hedges," "downtoners," "boosters," and "intensifiers" (Read, Hope & Carroll, 2007). Despite the assorted classifications, the language all serves the same function: to "graduate" the force or focus of an utterance by allowing speakers to convey more or less positivity (when regarding conveyance of *attitude)* or certainty (when regarding conveyance of *engagement*) (Martin & White, 2005). The semantic Appraisal category of *graduation* collapses these various markers into one category that describes the scaling of *attitude* or *engagement* according to intensity or amount, what Martin and White (2005) call *force*, and by prototype and preciseness, what the authors term *focus.* Specific examples of the scaling of Appraisal resources can be seen in the examples provided by Martin and White (2005) in Table 3.8-2 and Figure 3.8-3.

Table 3.8.2

Martin and White's (2005) Graduation Resource Scaling in Attitudes (p. 136)

	low degree ⟵		⟶	**high degree**
judgement	competent player	good player		brilliant player
	reasonably good player	quite good player	very good player	extremely good player
affect	contentedly	happily	joyously	ecstatically
	slightly upset	somewhat upset	very upset	extremely upset
appreciation	a bit untidy	somewhat untidy	very untidy	completely untidy
	attractive	beautiful		exquisite

To more precisely conceptualize *graduation* resources use in learners' evaluations of the RWT's usefulness, a visual depiction of the actual resources used by participants is provided. Figure 3.8-3 presents a visual representation of the types of *graduation* resources commonly used to scale learners' *appreciation* of the RWT's usefulness in both open-ended survey responses and stimulated recalls. The resources are situated along a continuum ranging from low to high based on the intensity of the resource in conveying evaluations about the RWT's usefulness. [2]

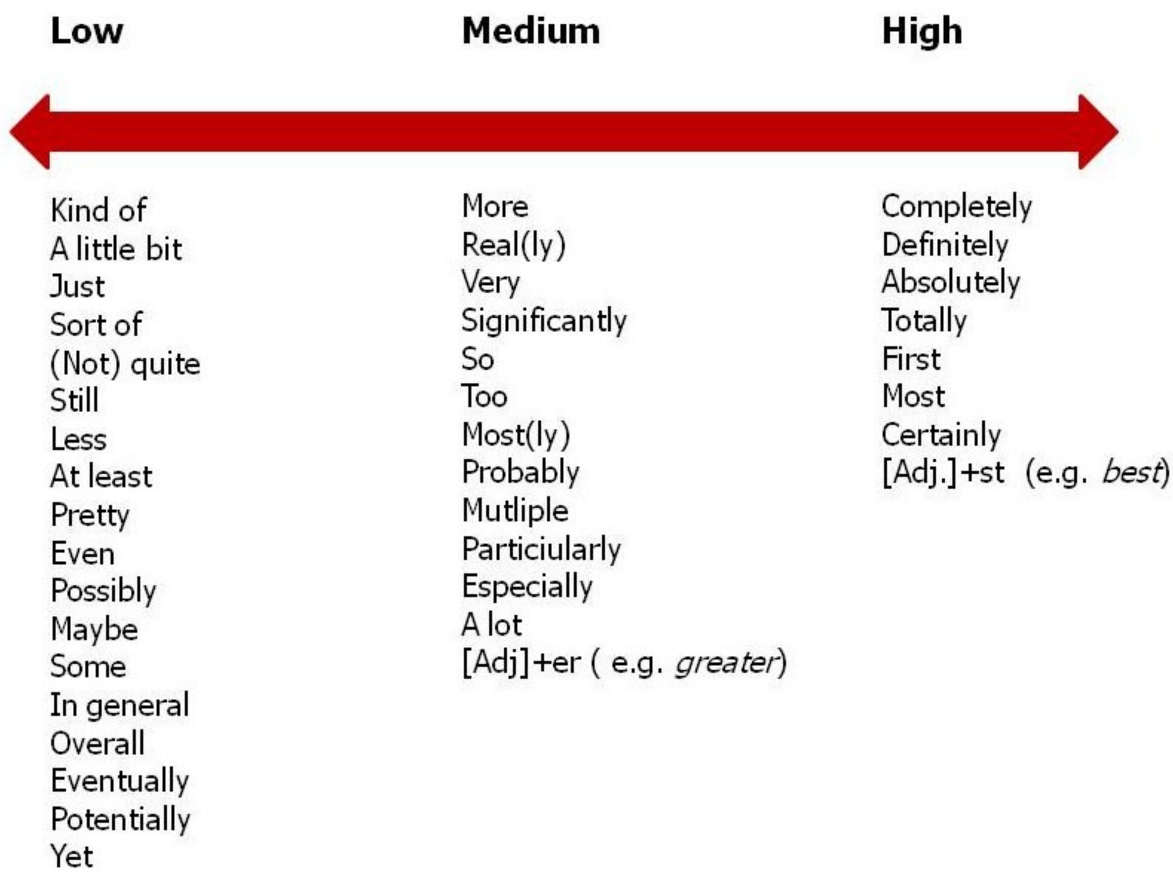


Figure 3.8-3. Continuum of *graduation* resources used to scale learner *appreciation* of RWT usefulness

Figure 3.8-4 presents a continuum of commonly used *engagement* resources as they appeared on a *graduation* scale from low to high.[3] Those labeled as low-graded *engagement* represent speakers' more tentative stance with regards to their assertions about the RWT's

[2] Prior *graduation* resource analyses (Economou, 2009; Liu, 2013; Martin & White, 2005) assisted in categorizing each resource along this graded continuum.
[3] Prior *graduation* resource analyses (Fryer, 2013; White, 2003) assisted in categorizing each resource along this graded continuum.

usefulness. Likewise, those scaled as high *graduation* signal speakers' enhanced certainty or confidence with regards to their evaluations.

Figure 3.8-4. Continuum of *graduation* resources used to scale learner *engagement* in their *appreciation* of RWT usefulness

An analysis of *graduation* resources used in study participants' evaluation of the RWT and their experience with the RWT helped to establish the strength or degree of these opinions from the participants. In particular, this analysis centered on the *graduation* resources participants used to scale their *appreciation*, *affect*, and *engagement* in responses to open-ended survey items and stimulated recall sessions to convey the force of their feelings towards and opinions about the RWT and their interactions with the RWT in terms of the tool's usefulness.

The *graduation* analysis further permitted a close examination of how strongly participants feel about their opinions of the usefulness of the RWT by their grading, or scaling, of evaluative resources, by accompanying *engagement* resources with words like "just," "maybe," or "simply," or preceding evaluative language with locutions like "really," "very," and "more," or by use of comparatives or superlatives through attachment of suffixes like –er or –est to *appreciation* adjectives (e.g., "biggest," "harder") (Read, Hope & Carroll, 2007). A *graduation* analysis relevant to resources used to convey *affect* helped identify degrees of the learners' emotions towards the tool and their experience with the tool by scaling the emotion from lower (e.g., "I like it") to higher (e.g., "I love it").

Lastly, the data analysis incorporated an examination of learners' usage of *affect* resources. In a preliminary read-through of the stimulated recall data, it was evident many learners evaluated the RWT and their RWT experience with emotional responses (especially, in terms of statements of like and dislike of the RWT or certain features of the tool). It was therefore determined that an analysis of the *affect* in learners' perception data may assist in determining participants' positive or negative reactions to the RWT. *Affect* is an attitudinal resource that involves speakers' construal of emotional reactions through their use of lexicogrammar (Martin & White, 2005). *Affect* resources are used to express both positive and negative emotions, including feelings such as anger, worry, boredom, interest, or anxiety, as reactions to behaviors, texts, processes, or phenomena.

According to Martin and White (2005), *affect* can be categorized into three major sets of emotions: happiness/unhappiness, security/insecurity, and satisfaction/ dissatisfaction. The happiness/unhappiness set concerns emotions which are "affairs of the heart" (e.g., resources like "sad" or "happy") (p. 49). This category also involves emotions such as love and hate, or milder version like and dislike. The security/insecurity set encompasses emotions pertaining to what Martin and White term one's "ecosocial well-being," and include feelings such as anxiety, fear, or confidence (e.g., resources like “anxious” or “assured”) (p. 49). The satisfaction/dissatisfaction category covers emotions regarding one’s pursuit of goals, such as respect, displeasure, and curiosity (e.g., resources like “fed up” or “absorbed”). Because RQ1a aimed to uncover RWT users’ evaluation of the usefulness of the tool and their user experience, *affect* resources fitting into the subsets of happiness/unhappiness and satisfaction/dissatisfaction were of particular interest in the perception data analysis.

Specifically, the coding process entailed a thorough systematic analysis of learners’ written responses to open-ended items on the post-task survey and stimulated recall transcripts to identify instances of *appreciation, engagement, graduation,* and *affect* language related to evaluations of the usefulness of the RWT. The initial step involved a manual coding of any lexical item which could be construed as an *appreciation* or *affect* resource.

It should be noted that while *appreciation* resources have commonly been described as being conveyed through the use of parts of speech such as adjectives, adverbs, or adverbial clauses (Hood, 2004; Mizusawa; 2010), *appreciation* resources in this study were identified as any language which construed the value of the RWT itself or the process by which users interacted with the RWT. Expanding the scope of classification of *appreciation* resources in this dissertation data analysis allowed for the researcher to capture all instances of judgment of the RWT and the users’ experience with the tool. Discerning other parts of speech as *appreciation* was particularly integral for this dissertation for two main reasons. One reason is that many of the study participants were NNSs and may have experienced difficulty conjuring the appropriate adjectives, adverbs, or adverbial clauses to evaluate their experience with the RWT. The second reason concerned the nature of the data. Much of the learner perception data were spoken data captured in stimulated recalls, with students responding verbally to prompts using casual and less academic language. Because it well documented that spoken language is less grammatically complex than written language and tends to contain, among other linguistic features, fewer attributive adjectives, adverbs, and adverbial phrases (Biber, Johansson, Leech, Conrad & Finegan, 1999; Chafe, 1982; Cook, 1997; Halliday,1989), broadening the identification of *appreciation* to include other parts of speech, such as verbs ("It **helps** me"), nouns ("a **problem**"), or verbal phrases ("I **don't agree**"), permitted an analysis of how learners, NNS and NS alike, assessed the RWT and their experience with the tool with the language in which they were most comfortable conveying *appreciation*.

All instances of *appreciation* of the usefulness or the RWT or processes involving use of the RWT were bolded and the object or process being appreciated was highlighted in yellow. The example below, with text deriving from Martin and White (2005) *appreciation* resource analysis of a *USA Today* preview of M. Ondaatje's 2000 novel *Anil's Ghost*, visually illustrates the identification and coding of *appreciation* resources that was conducted in this dissertation:

> **"Virtually flawless**, with **impeccable** regional details, **startlingly original** characters, and a **compelling** literary plot that borders on the thriller, Ondaatje's **stunning** achievement is to produce an **indelible** novel of **dangerous beauty**". USA Today [Previews M Ondaatje Anil's Ghost Toronto: Vintage. 2000: i]

An identical coding process was undertaken for participants' use of *affect* resources that concerned their [dis]satisfaction and/or [un]happiness with the RWT and their RWT experience. All *affect* resources were bolded and the object or process to which the participant was reacting, what Martin and White (2005) term the "trigger," was coded in pink. *Affect* was coded as instances of both happiness and unhappiness and satisfaction and dissatisfaction. Resources involving learners' moods in terms of like or dislike of the RWT and their RWT experience often took the form of lexicogrammatical resources conveying unhappiness (e.g., "misery" or "hate") or happiness (e.g., "cheerful" or "love"). Those *affect* resources which conveyed satisfaction and dissatisfaction, encompassing attitudes of achievement (e.g., "engaged" or "interested") or frustration (e.g., "bored' or "sick of") with the RWT or the RWT, were also identified as *affect*.

Once the *appreciation* or *affect* resource was identified, the surrounding textual environment of *appreciation* was assessed for *engagement* and *graduation*[4]. The coding of resources in the semantic category of *engagement* entailed identification of how the participant engaged in the RWT evaluation. *Graduation* resources were noted as those resources which contributed to the magnification, diminishment, or honing of *appreciation* of the RWT and users' experiences, and the *engagement* resources used to convey this evaluation.

Lexical items evaluating the quality or worth of the RWT or processes involving participants' interactions with the RWT which could be construed as an *appreciation* resource were put in **bold** lettering, and the *appreciated* object or process highlighted in yellow (as shown in the example above). Lexicogrammar construing participants' emotional reaction to the RWT or their RWT experience were also put in **bold** lettering, with the object or process serving as the "trigger" being highlighted in pink. *Engagement* resources that pertained to a learners' evaluation of the RWT or their experience with the tool in terms of

[4] *Engagement* and *graduation* resources pertinent to *affect* were not explored in this study. Because RQ1a was concerned primarily with participants' evaluation (i.e., *appreciation*) of the usefulness of the RWT, analyses of *engagement* and *graduation* resources surrounding *appreciation* resources permitted deeper understanding of students' assessment of their RWT experience. Such analyses were deemed unnecessary for the *affect* resources, as this analysis was supplementary and added later in the coding process when emotional reactions were observed with regularity.

usefulness were put in *italics* and those instances of *graduation* (used to intensify or soften speakers' opinions) were underlined. The sample text below (derived from pilot study data) illustrates how the final coded text appeared in the qualitative data (survey and stimulated recall transcripts):

> *I think its an* **interesting** tool and *could be* **useful** especially if the accuracy is improved. *The way the multiple drafts is handled is* a bit **confusing**, especially when dealing with comments on older drafts. A better text editor *would be* **helpful**. *It would be* **nice** to see a subtle highlighting of sentences I had already commented on. But, overall, I liked the program.

Upon a second reading of the open-ended items and stimulated recall transcripts, all resources were confirmed and any remaining resources not detected in the initial reading were identified. At this point in the coding, all Appraisal resources underwent further functional analyses. For the *appreciation* resources, the context of participants' evaluation was further analyzed to determine whether the evaluation of the object (the RWT) or process (learners' RWT experience) was positive or negative, and the positive or negative charge was recorded per *appreciation* resource. For the *affect* resources, the context of the learners' emotional response to the RWT and their RWT experience was investigated to ascertain first whether the response could be classified as conveying a positive or negative emotion.

Though it is common to extract and separate identified coded units from the overall data set (their original textual environment), throughout the coding process in this study, it was critical the discourse remain in its original context. For instance, in Martin and White's (2005) example text analysis from *USA Today*, the *appreciation* resources *startlingly, dangerous,* or *original* could perhaps be conceived of as either positively or negatively charged were they to be analyzed apart from their surrounding context; therefore, in this study, participants' discourse was kept intact and analyzed in the context of its original use to gather a clearer picture of the learners' linguistic intent and to avoid potential misinterpretations of participants' perceptions or their RWT experience. In instances in which the positive or negative charge of the *appreciation* or *affect* was unclear, the audio recording was consulted to discern voice inflections in intonation or pitch which may allude to the positive or negative nature of the evaluation or emotional response.

An analysis of *engagement* resources involved first classifying the resources as either monoglossic or heteroglossic. Heteroglossic resources were then further categorized by their role as *contracting* (*disclaiming* or *proclaiming*) or *expanding* (*entertaining* or *attributing*) the evaluation. In cases where there was an implicit response to a particular prompt or a portion of propositional content in the response was implied, such as in cases of leading questions, the *engagement* was identified as being heteroglossic. Martin and White (2005) argue such *engagement* is indeed heteroglossic, as propositional content is still asserted by carrying through the content in an implicit understanding of the previously expressed proposition. In the qualitative survey or stimulated recall data, an example of such a participant's response to a leading question could be a fixed expression such as "no" or "yes," or an implicit assertion in another form of ellipsis, such as "a positive one" when asked a question like "What kind of interaction would you say you had with the RWT?" If the responses to prompts or questions were in the form of questions themselves, this can also be discerned as heteroglossic, as these questions arise and perpetuate a communicative context of dialogistic turn-taking and entertains that alternative propositions are likely or possible (White, 2003). Therefore, both implied content responses and question responses were classified as heteroglossic resources.

Engagement resources implying justification of some sort (such as “because,” “thus,” “for this reason) were coded as heteroglossic as well. White (2003) argues that conjunctions and connectives that convey consequentiality are intrinsically dialogic, because they position the textual voices engaging in an argument, play an intentional part in persuading an interlocutor, and hold a viewpoint rather than assume the audience accepts the assertion as a given or fact.

Graduation resources were further analyzed in the context of the evaluation to determine to what degree they raised or lowered the evaluation, or degree of *engagement.* The resources were then situated along a scale from “LOW” to “HIGH” in terms of the degree to which they scaled the *appreciation* or *engagement* (i.e., amplifying or diminishing the intensity of their RWT evaluation). White’s (2003) and Martin and White’s (2005) intensive *engagement* analysis were consulted in the determination of where along the scale these resources should be placed.

Next, quasistatistics for each resource category were calculated by numerical tallying. For *appreciation* analysis, positive and negative *appreciation* resources were calculated per participant. For *affect* resources, positive and negative resources were tallied per participant. For the *engagement* resource analysis, the type (monoglossic or heteroglossic), function (contracting or expanding) and sub-function (proclaiming, disclaiming, entertaining or attributing) of *engagement* were tallied. For the *graduation* analysis, counts of low, medium, and high grades for *graduation* of *appreciation* and *engagement* resources were compiled. Finally, emergent themes in the use of *appreciation* and *affect* resources (Hyland, 2000; Salager-Meyer, 1998, 1999, 2001; White, 2002) were identified and discussed. Tallies for each of the resources and their positive/negative charges were then used for data triangulation with participants' quantitative Likert-scale survey responses.

Per recommendations by Mackey and Gass (2011), inter-coder reliability was assessed early on in the coding process so as to establish means for reducing coding errors before much time and energy had been expended coding the entire dataset. As with the inter-transcriber reliability calculations, only a sample of the overall qualitative data to be coded was subjected to double-coding; 20 percent of the qualitative data underwent double-coding, following Mackey and Gass's (2011) guidelines for establishing inter-coder reliability.

Because Mackey and Gass (2011) argue that "it is desirable to select samples from different sections of the dataset to increase representativeness" (p. 217), portions to be double coded were selected based on stratified random sampling technique in which samples were chosen from every participant (including the instructor), data source (interviews, stimulated recalls, open-ended response items on surveys) and coding category (aiming to include a variety of identified *appreciation* resources) in proportions that corresponded to the main overall dataset (Ortega, 2000).

The second coder, a fifth-year PhD student studying in the Applied Linguistics program, was chosen because she had experience coding large amounts of qualitative data and had experience in classes dedicated to exploring the application of systemic functional approaches to teaching, learning, and data analysis. This second coder was also particularly familiar with discourse analysis using the APPRAISAL Network (Martin, 2004; Martin & Rose, 2003), as she applied this network to analyze data in her own dissertation research project. Prior to having the second coder analyze the text, she underwent a one-hour training session in which she was reminded of and given practice analyzing sample texts using the

APPRAISAL Network. This training and practice session served as a means of spotting potential misinterpretations of the coding schema so the issues could be properly addressed prior to coding the sample of the actual dissertation data (Howitt & Cramer, 2007). After the training period, the second coder was given the selected 20 percent of the stimulated recall and open-ended response item data to analyze using codes supplied by the APPRAISAL Network. The second coder was also involved in determining the charge of the *appreciation* or *affect* resources (as positive or negative).[5]

Finally, a Cohen's kappa statistic (Cohen, 1960) was calculated to discern the average rate of agreement amongst the two coders. Cohen's kappa was specifically chosen over other statistical measures because it provides a reliability index for categorical variables such as those included in the APPRAISAL Network, the pre-existing schema used for coding in this study. Calculating a Cohen's kappa, a more robust reliability measure than simple percentage agreement, allowed the author to account for the frequency of both agreements and disagreements (Orwin & Vevea, 2009). The minimum acceptable inter-coder agreement was set at 75 percent, and agreement above 90 percent was considered "ideal" (Mackey & Gass, 2005, p. 244). The calculated Cohens kappa value for *appreciation* resource (and charge) identification for RQ1a was 0.926 and the value for *affect* resource (and charge) was 0.851. Both kappa values indicate very strong reliability among the two coders of *appreciation* and *affect* resources in the sample text. Because the purpose of the second coder was simply to check for and report an acceptable level of inter-coder reliability, unless the inter-coder classifications and coding proved glaringly disparate, disagreements were left unresolved and

[5] The monoglossic or heteroglossic nature of the *engagement* resources and scaled level (low, medium, or high) of the *graduation* resources were not double coded, as not only were these were secondary data analyses support the primary Appraisal resource analysis, but also to preserve time for the second coder to check the reliability of other coding categories for additional research questions.

codes assigned by the primary investigator were included in the analysis (Howitt & Cramer, 2007).

After the quantitative and qualitative data were analyzed separately, the data were triangulated to better understand learners' perceptions of RWT usefulness. Prior to merging the data sets, quasi-statistics were calculated based on the number and types of *appreciation, graduation* and *engagement* resources appearing in students' open-ended responses on the post-task survey and in the stimulated recalls (Barton & Lazarsfeld, 1955; Maxwell, 1996). This involved first tallying the total instances of each Appraisal resource per student in both qualitative survey data and stimulated recall transcript data. It was important that these numbers were calculated, as the totals of the Appraisal resources and their positively or negatively charged orientation held the potential to reveal trends in students' evaluation of their experience with the RWT. The *appreciation*, *engagement, graduation,* and *affect* source totals for participants' open-ended survey responses and stimulated recalls were then triangulated with participants' Likert-scale responses to questions about the RWT's usefulness. Triangulating the quantitative and qualitative data helped validate findings from qualitative and quantitative data sets as well as enhance insights into how learners' perceive the usefulness or the RWT.

RQ1b: To what degree do learners trust the RWT tool?

Learner perception data from participants' responses to Likert-scale items on the post-task survey were analyzed to answer RQ1b. Similar to previous studies investigating students' trust in AWE systems (Hyland & Hyland, 2006; Yang, 2004), descriptive statistics of the Likert-scale responses were calculated to reveal learners' trust in automated writing evaluation programs in general, and in the RWT tool.

An SFL analysis of the *appreciation, graduation*, and *affect* resources students used to discuss their trust in the RWT was also conducted on participants' responses on the qualitative portion of the post-task survey and in the stimulated recalls. The analysis involved a coding process identical to that conducted for analyzing data in response to RQ1a; the process consisted of systematic coding, interpretation, and quantification of *appreciation* and *graduation* resources participants used for describing their trust in the RWT tool. The analysis of *affect* resources followed a slightly different process in that instead of coding for lexicogrammar conveying the emotions of happiness/unhappiness and satisfaction/dissatisfaction, categories more pertinent to RQ1a —learners' evaluation of the usefulness of the RWT and the RWT experience —*affect* resources fitting into the set of security/insecurity, used for conveying peace, security, and comfort, were of more interest in answering RQ1b (Martin & White, 2005). Directing the coding towards identify positive and negative *affect* resources used to express security (like "confident" or "trusting") or insecurity (like "anxious" or "surprised") allowed a more targeted analysis of the emotional responses participants felt when discussing their trust of the RWT.

The analysis of *appreciation* resources participants used to evaluate their trust in the RWT and RWT feedback enabled a more in-depth understanding of the charge (positive or negative) of evaluative language being used to discuss learners' trust in the RWT. An *affect* analysis of learners' language used to convey the security or insecurity felt while using the RWT or about the RWT helped to establish the positive or negative emotional responses learners had in their statements about their trust of the RWT. A further analysis of *graduation* resources in learners' discussion of trust in the tool was particularly useful for answering this research question (aimed at discerning the degree of trust learners had in the tool), as it permitted a systematic means of identifying and describing the degree to which learners trusted the tool through an investigation and assignment of the degree (low, medium, or high) to which learners scaled up or scaled down their expressions of trust in the RWT.

Coding procedures followed precisely the processes detailed above for RQ1a. The data were first coded in the surveys and stimulated recalls according to resource; *appreciation* and *affect* resources were then analyzed to determine their charge (positive or negative) and *graduation* resources analyzed in terms of their degree (from low to high) of scaling *appreciation.*[6] As with RQ1a, the analysis of qualitative data for answering RQ1b included the addition of a second coder for reliability checks and calculation of a Cohen's kappa statistic to ascertain consistency among coders. The calculated Cohen's kappa reliability for *appreciation* resources and charges was 0.761, suggesting a decent degree of consistency among coders' identification of *appreciation* resources and resource charges. The Cohen's kappa value for *affect* resource coding and positivie or negative charge identification was 0.645, indicating less than ideal reliability among the two coders. Once all resources were identified and the sub-classifications and charges (with *appreciation* and *affect* resources) assigned, the resources were tallied by participant.

Once the quantitative and qualitative data had been separately analyzed, the data were triangulated to obtain a clear sense of students' degree of trust in the RWT. To accomplish this, similar calculations of quasi-statistics based on participants' use of *appreciation, affect,* and *graduation* resources coded in the stimulated recalls were conducted prior to data triangulation.

[6] Similar to the Appraisal analyses for RQ1a, *engagement* nor *graduation* analyses were not conducted for the lexicogrammatical environment surrounding *affect* resources, as RQ1b centered first and foremost on learners' evaluation (*appreciation)* of trust in the RWT.

RQ1c: What degree of control do learners perceive they have when using the RWT?

Descriptive statistics were calculated based on learners' responses to post-task Likert-scale survey items about the amount of control learners perceived when interacting with the RWT. The same *appreciation* resource analysis conducted for RQ1a-b was conducted on the learners' discourse (from simulated recall transcripts) in describing their perceptions of control when using the RWT. Finally, all quantitative and qualitative data pertaining to participants' perceptions of control using the AWE tool was triangulated to discern what degree of control learners perceive having during their RWT interaction.

As with research questions RQ1a-b, a systemic functional analysis of the *appreciation,* and *graduation* resource was conducted on participants' open-ended survey responses and stimulated recall transcripts to better understand the degree of control the learners felt while using the RWT. (Unlike RQ1a-b, no *affect* analysis was conducted to answer RQ1c, as no *affect* resources were detected in the data with regard to learners' perceptions of the degree of control they felt while interacting with the RWT.) In particular, the *appreciation* analysis allowed a more careful isolation and investigation of the kinds of evaluative language learners used to discuss the control they felt while using the RWT as well as how the evaluation of perceived control was charged (positively or negatively). Examining those *graduation* resources learners' used to discuss perceived control over the RWT was especially beneficial for this research question (focused on determining the degree of control (low, medium, or high) participants felt when using the RWT), as it allowed a thorough and methodical way of ascertaining how learners graded their perceived control along a scale from low to high.

Similar coding processes as those utilized to investigate RQ1a-b were used to analyze data in answering RQ1c. After coding the *appreciation* and *graduation* resources in the survey responses and stimulated recall data, the charge (positive or negative) of each *appreciation* resource was determined and the degree (low, medium, or high) of each *graduation* resource in grading *appreciation* was distinguished. A portion of the qualitative data aimed at answering RQ1c was also coded by a second coder to secure reliability in the coding process, and a Cohen's kappa statistic was calculated. The Cohen's kappa statistic checking reliability of coding of *appreciation* resources and positive or negative charges was 0.717, suggesting a reasonably good degree of agreement among the two coders identifying the presence and charges of *appreciation* resources responding to RQ1c. Each resource category and subcategory was finally tallied by frequency of use per participant. After separate analyses of the quantitative and qualitative data, data results were triangulated to provide a detailed picture of learners' perceived degree of control in their experience using the RWT.

RQ2a-b: Learner interaction behaviors and strategies using the RWT

RQ2a: How do learners interact with the RWT tool?

Similar to studies exploring participants' user behavior patterns (Heift, 2002; Pujola, 2001), qualitative and quantitative data were analyzed to answer the question of *how* participants interacted with the RWT. Because Heift (2002) holds that investigating learner interaction in a grouped manner allows researchers of L2 learning to identify patterns in how learners exercise control over a CALL program's capabilities, numerical tallies of specified user behavior data stored in the RWT's database were examined. The tallies provided an

Table 3.8-3.

Data Analyses Used for Answering RQ2a-b

RQ addressed	***Interaction and Introspective Data***	***Analytical technique***
RQ2a: *How do learners interact with the RWT tool?*	RWT database frequency tallies of interactions Screen recordings of RWT interactions Researcher & teacher observations	Descriptive statistics (QUANT) Inductive analysis of video (QUAL) Inductive analysis of notes/interview transcripts (QUAL)
RQ2b: *What strategies do learners report using in their interaction with the RWT?*	Cloze-item responses on pre-task questionnaire Open-ended responses on post-task survey Transcripts of stimulated recalls	Descriptive statistics (QUANT) Inductive analysis, coding (QUAL & QUANT) Inductive analysis, coding (QUAL & QUANT)

indication of frequency of use for particular features of the tool (such as frequency accessing the Demonstration Module examples or the number of overall submitted drafts), and gave a picture of general trends and patterns in user behavior (Heift, 2002). Per recommendations by Nix and Wylie (2011), descriptive statistics of the tallies were generated to gather an overall picture of participants' use of certain features of the tool.

Screen recording data assisted in corroborating the interaction data stored in the RWT database. Qualitative data from observations of students' video screen captures were inductively analyzed to determine notable patterns or trends in students' interactions with the RWT. Individuals' behaviors were noted first, then students' behaviors were compared to distinguish potential classification of behavioral trends in groups (Heift, 2002).

Specifically, analysis of the video screen captures involved applying systematic observational techniques adopted from usability studies in the field of human– computer interaction. The analysis consisted largely of an adaption of analytic methods typically included in task analysis, a type of usability analysis aimed at understanding how users perform particular tasks and achieve their intended goals us by observing those users in action (Hackos & Reddish, 1998; Mori, Paterno, & Santoro, 2002). In such an analysis, the researcher observes users in real time or via recorded human– computer interaction to witness the users in their natural work environment; during this observation, the researcher made notes on how the user interacts in the virtual environment (Hackos &Reddish, 1998).

In this dissertation study, the analysis answering RQ2a involved a combination of two task analysis-oriented human–computer interaction observational techniques: the sequence model and the time-on-task model (Phipps, Meakin, & Beatty, 2011). Applying the sequence model, screen captures were individually analyzed in terms of the sequence of learners' interactivity (as indicated by mouse movement) with particular features of the tool. Applying the time-on-task technique, the length of time users spent interacting with (also based on mouse movement) the particular features of the tool was recorded and noted. Thus, the task analysis involved notation of both the order in which RWT users accessed RWT features, along with the length of time users spent interacting with the particular feature. The result is a detailed depiction of individual user usage of the RWT. Graphs showing individual patterns of RWT interaction were generated for comparison to other RWT users so potential trends in RWT use could be noted. The collective time students allotted to interaction with specified RWT features was also tabulated per individual and grouped to show emergent trends in RWT users' use of the AWE tool to revise their Introduction section draft.

Also, inductive analyses were conducted on transcripts from the teacher interview and on observational notes taken by the researcher during students' interaction with the RWT, as has been accomplished in similar research (Grimes & Warschauer, 2010; Nix & Wylie, 2011). Participant behaviors as well as comments participants made during their interaction *about* their interaction were noted in the analysis of teacher and researcher observational notes. Analysis of the observational notes taken by the researcher and transcripts of the instructor interview about participants' in-class behaviors during RWT interaction aided in determining participants' behavioral patterns.

Specifically, the inductive analysis was conducted by first coding according to prominent themes, as conducted by Cotos (2011), Nix and Wylie (2010) and Pujola (2001). This coding process involved a preliminary reading where dominant recurring themes were identified. A second coding round consisted of a reconfirmation of initial themes, and notation of any additional themes occurring in participant responses. Next the researcher examined began a third coding of the whole dataset with the finalized coding schema. Once final coding categories were established, notable and/or representative participant quotations were extracted and analyzed to illustrate characteristic trends in the category and in the observational notes and interview transcript.

RQ2b: What strategies do learners report using in their interaction with the RWT?

Quantitative and qualitative data analyses were conducted to answer RQ2b on learners' strategies in RWT interaction. First, descriptive statistics on participants' responses to cloze-item questions about preferred working environments and preferred contexts for learning new technology (alone, with a partner, or with a group) were calculated. The primary investigator then conducted inductive analyses of the students' descriptions of strategies in open-ended post-task survey responses and stimulated recalls. In an initial reading of the qualitative data, emergent themes in individuals' preferences were noted and representative or indicative direct quotations were highlighted for later description of the themes. In a second reading, these preliminary themes were confirmed, discarded, or expanded, and codes developed. The codes were then described in more detail and illustrative quotes from the data were extracted to show representativeness of the coding categories.

A second coder then analyzed 20 percent of the same data (sample again selected through random sampling techniques), engaging in the same close readings and development of codes as had been accomplished by the primary investigator. A Cohen's kappa statistic was then calculated to determine consistency among coders. The value of Cohen's kappa for the two coders' reliability of coding of data answering RQ2b was 0.861, demonstrating much consistency among coders, according to Mackey and Gass (2005). The primary investigator then checked both coders' developed codes for overlap, and the entire dataset was coded using the final established coding schema. Finally, frequency counts of the codes appearing in the data were tallied, first by participant then as a whole class.

Descriptive statistics of students' preferences for working and learning environments were then triangulated with the qualitative coded data and frequency counts of coded participant responses and compared with the results for RQ2b to capture a detailed account of individual users' experience with the RWT. Emergent themes in class codes were analyzed and discussed in conjunction with student responses concerning their use of the RWT as well as their actual use of the AWE tool. This data triangulation assisted in validating quantitative and qualitative data analysis results regarding participant strategies for learning new technology as well as interacting with the RWT for draft analysis.

RQ3a-b: The impact of learner variables

Table 3.8-4

Data Analyses Used for Answering RQ3a-b

RQ addressed	***Learner demographic & perception data***	***Analytical technique***
RQ3a: *How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?*	Cloze-item responses on pre-task questionnaire Open-ended responses on post-task survey Transcripts of stimulated recalls	Descriptive statistics (QUANT) Inductive analysis, coding (QUAL & QUANT) Inductive analysis, coding (QUAL & QUANT)
RQ3b: *What other learner variables do participants perceive as impacting their interaction with RWT?*	Open-ended responses on post-task survey Transcripts of stimulated recalls	Inductive analysis, coding (QUAL & QUANT) Inductive analysis, coding (QUAL & QUANT)

RQ3a: How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?

Because understanding users' comfort level with technology helps us understand how they interact with new technological tools (Heift & Rimrott, 2007), students pre-task questionnaire responses to questions about previous experience using and comfort level learning new technology were analyzed in combination with their post-task survey open-ended responses on the perceived impact of their technological experience on their interaction with the RWT.

First, descriptive statistics of learners' self-report data from Likert-scale responses on the pre-task questionnaire were generated. These items gauged students' background experience with and comfort level using computers, new technology, and computer-based language learning tools. Calculating descriptive statistics of class members' responses as a whole provided a global impression of the group's background experience with and comfort using technology. The Likert-scale responses were also examined on a student-by-student basis to ascertain learners' "readiness" for learning new technology (Oliver, 2001), technological literacy (Rossiter & Watters, 2000), and capacity for self-regulated learning (Oliver, 2001).

Next, an inductive analysis was conducted on students' responses to open-ended post-task survey items and stimulated recall questions specifically asking about the perceived impact of their background experience with technology on their use of the RWT. This inductive analysis mirrored the close reading and code-development process for RQ2b: initial notation of emergent themes about technology experience impacting learners' RWT interactions, confirmation of preliminary codes, description of coding categories, analysis and code-development by a second coder, inspection of overlap in the coders' categories, calculation of Cohen's kappa statistic from two coders' established codes (Cohen's kappa = 0.881, suggesting a high level of consistency among the coders), finalization of coding schema, coding of entire data set according to final schema, and tallying of frequency of codes in participant responses by participant and by class.

When both quantitative and qualitative data had been analyzed, results were triangulated to determine how learners perceived their previous experience using computers as impacting their interactions with the RWT. The triangulation encompassed a combined analysis of participants' responses on the pre-task questionnaire about their experience with and comfort level using computers, new technology, and computer-based language learning tools and the codes emerging from the post-task survey open-ended responses and stimulated recalls responses about students' technological experiencing their RWT experience. The combined analysis required responses to first be separately analyzed, so individual learner data can be directly compared and contrasted; class data were then merged for analysis and discussion.

RQ3b: What other learner variables do participants perceive as impacting their interactions with the RWT?

To answer RQ3b, participants' responses to an open-ended post-task survey item and stimulated recall question directly asking what other characteristics learners perceive as impacting their experience with the RWT was analyzed. The inductive analysis involved coding of participant responses by both the primary investigator and a second coder, as was conducted for previous research questions. A similar comparison of both coders' codes, calculation of a Cohen's kappa statistic to verify inter-coder reliability (Cohen's kappa = 0.894, indicating strong reliability of the coding and development of coding categories), and tallying of code frequency counts of the entire coded data set was also performed.

Investigating learners' interactions with the RWT and feedback about the RWT's effectiveness through this multidimensional approach enabled a more comprehensive understanding of learners' engagement with the AWE tool. Furthermore, the combination of quantitative and qualitative analyses conducted from a variety of theoretical approaches to answer the research questions provided rich and descriptive information about how the RWT was used by students, what learner characteristics learners perceived as impacting their interactions, and how they perceived the RWT as helping or hindering their success in learning how to write in the research article genre.

CHAPTER 4.

RESULTS AND DISCUSSION FOR RESEARCH QUESTION 1

This chapter reports and discusses the findings related to the first set of research questions guiding this dissertation study. To review, the research questions under the learner perception-oriented RQ1 were:

RQ1a: *How do learners perceive the usefulness of the RWT?*

RQ1b: *To what degree do learners trust the RWT?*

RQ1c: *What degree of control do learners perceive they have when using the RWT?*

The chapter is organized by the research questions corresponding to learner perceptions of the RWT. Due to the meticulous detail of the analyses, executive summaries directly outlining answers to the research questions are provided at the start of each section so in-depth analyses may be bypassed if the reader so chooses. For those interested in the detailed analyses providing responses to each question, page numbers are provided. Descriptive statistics of quantitative results, along with relevant graphs or figures summarizing the results, are given where necessary. Samples of learner discourse and visuals illustrating trends in learners' perceptions of their experience with the Research Writing Tutor are provided when reporting the qualitative data. In cases where a variety of quantitative and qualitative data are used to answer a question, results are triangulated to provide a more thorough depiction of learners' perceptions of the RWT. Findings are interpreted following the report of results for each question. Previous relevant literature is incorporated into the discussion of the findings to help contextualize and make meaning of the current study's results.

Results of RQ1a-c on learner perceptions of their RWT experience reveal that learners found the RWT to be useful and were positive in their attitudes about helpfulness for the tool in the future if issues in feedback accuracy were improved. Learner perception data also revealed wavering trust in both the RWT and automated writing evaluation programs as a whole, with a number of trust issues stemming from the inaccurate feedback students received from the RWT analyzer in their Introduction section draft revisions. Lastly, students perceived they had varying degrees of control when interacting with the RWT, with learners citing both system allowances and restrictions as factors impacting their control of the AWE program during draft revision. The following section addresses the results relevant to each question regarding learners' perceptions of the RWT and of their experience with the RWT.

Section 4.1. RQ1a- Learners' Perceived Usefulness of the RWT

In answering RQ1a —*How do learners perceive the usefulness of the RWT tool?* — both quantitative and qualitative measures were used. Results of the quantitative and each qualitative (SFL) analysis are presented first. The results of the data triangulation of quantitative and qualitative results, for individual learners and for the class as a whole, are then presented.

Executive Summary

Findings from analyses conducted to answer RQ1a on learner perceptions of usefulness of the RWT tool and RWT feedback revealed general positivity in participant responses to using the tool for RA section draft revision. An analysis of participants' responses to questions on the post-task survey gauging learners' perceived usefulness in the RWT showed all learners believed the RWT to be useful in helping them to improve their research writing skills and would like to use the AWE tool again for future draft revisions. Furthermore, all participants reported that they understood the RWT feedback and that the feedback prompted the students to think twice about their intended rhetorical meaning in the section drafts.

Findings from the APPRAISAL analysis of learners' open-ended responses on the post-task survey and in stimulated recalls reveal that learners were more positive than negative in their statements judging the RWT's usefulness, positively evaluating the RWT and RWT feedback as "beneficial," "useful," or "helpful." Negative *appreciation* resources were used primarily in assessments of the RWT feedback accuracy as "wrong" or "incorrect," depicting such inaccuracy as an "issue" or a "problem." An analysis of *graduation* resources showed learners were more prone to use medium-scaled resources than high-scaled or low-scaled resources in participants' judgments of the RWT's usefulness, pointing to students' strong commitment to their RWT evaluations. Participants' greater use of heteroglossic *engagement* resources for positively *appreciating* the RWT, conveyed commonly through the lexicogrammar "I find," "I think," and "I feel," emphasize the learners' openness to considering alternative perspectives about the RWT's usefulness in their evaluations. In all, the *appreciation* analysis highlights learners' positivity in evaluating the convenience and usability of the RWT, and enthusiasm about potential growth of the RWT shown through participants' readiness to provide suggestions for ways to improve the tool.

An APPRAISAL analysis of *affect* resources reveals a mix of both positively and negatively charged emotional responses to the RWT in evaluations of the tool's usefulness. Positive *affect* was revealed in participants' descriptions of "liking" or "loving" particular functions of the RWT, and expressed curiosity about the tool and motivation to use the RWT feedback to improve their RA section draft. Negative *affect* was communicated regularly through the expression of such emotions as surprise or shock and puzzlement or confusion in response to learners' receipt of section draft-specific feedback they considered to be inaccurate.

In all, the analyses answering RQ1a revealed the RWT users were optimistic about the future potential of the RWT, and commented heavily on the projected usefulness of the tool as the accuracy of the analysis and feedback are improved. Detailed findings from and discussions of the Likert-scale survey response data analysis and APPRAISAL analyses are provided below.

Quantitative Analysis for RQ1a

Quantitative analyses of students' Likert-scale responses to questions about perceived usefulness of the RWT revealed that learners, in general, found the RWT tool and their experience with the RWT to be useful. After normalizing the Likert-scale responses and adjusting all question wording of responses so that "1" signified the most disagreement and "4" indicated strong agreement, the Median, Mean, and Standard Deviation were determined for questions on the post-task survey asking about learners' perceived usefulness of the RWT. Descriptive statistics for responses to the following specific questions are provided below in Table 4.1-1.

Based on the results displayed in the table, the 11 study participants primarily agreed (Median=3 and all Mean scores ranging from 3 to 3.36) with the post-task survey statements concerning the RWT's ease of use, comprehensibility of RWT feedback, willingness to change their writing based on the feedback, helpfulness and usefulness of the tool, and desire to use the RWT again.

Table 4.1-1

Descriptive Statistics for Likert-Scale Items on Perceived Usefulness of the RWT

Post-Task Survey Item	Median	Mean	St. Dev.
I found the RWT easy to use.	3	3.18	0.6
I understood the feedback.	3	3	0
The feedback made me think twice about my writing.	3	3.36	0.5
I will change my writing based on the RWT feedback.	3	3.27	0.47
The RWT tool helped me develop skills for writing research articles.	3	3.09	0.3
The RWT tool is useful for improving research article writing skills.	3	3.18	0.4
I would like to use the Research Writing Tutor again.	3	3.36	0.5

Note. N= 11. All response scores based on a Likert-scale where 1= strongly disagree and 4= strongly agree.

Most learners found the RWT easy to use (Mean= 3.18), with no learners reporting strong disagreement with the statement on ease of use and only one learner (P7) disagreeing (with a response of “2”) that the tool was “easy to use.” Interestingly, all 11 participants marked agreement with the statement “I understood the feedback.” Also, the students either agreed (N=7) or strongly agreed (N=4) that the feedback provided by the RWT prompted them to think twice about what it was they intended with specific sentences in their writing. In terms of integrating what they had learned from their RWT experience into later drafting stages of their writing, all learners either agreed (N=8) or strongly agreed (N=3) that they would modify their writing based on RWT’s feedback. All learners believed the tool was useful (N=9) or very useful (N=2) for helping improve research article writing skills; specifically, participants either agreed (N=10) or strongly agreed (N=1) that the RWT helped them in improving their own individual skills in writing research articles. Finally, every participant agreed (N=8) or strongly agreed (N=3) that they would want to use the RWT again.

To summarize results from the quantitative analysis for RQ1a, learners not only found the RWT to be easy to use, but also understood the automated feedback they received from the tool, were challenged to re-think their rhetorical intentions when using the tool and believed the RWT to be useful in the improvement of research writing skills. These perceptions are echoed in the learners' desire to use the RWT again for research article draft revisions.

The findings from the analysis of post-task survey Likert-scale responses can be recognized as positive when considering the current and future usability and usefulness of the RWT. One positive aspect of these findings pertains to learners' perceptions of ease of use, an important aspect when determining the usability of a program or application (Shackel, 1991). Study participants overall found the RWT easy to use, with only one learner disagreeing the RWT was easy to use; this finding suggests other first time users of the AWE tool may have similar perceptions and be able to perform their research article section draft revisions using the RWT with little difficulty.

The quantitative results further show that the RWT compelled learners to question the rhetorical intentions in their sentences and make modifications based on the analyzer's feedback. These findings directly reflect some of the primary goals of the RWT: to prompt writers to revisit their texts, reexamine their rhetorical intentions, and make changes to their drafts for enhanced communicative effectiveness. From a systemic functional perspective, a process such as this, in which writers return to their drafts to more closely inspect their lexicogrammatical choices, helps writers recognize how their linguistic choices connect to their intended meanings, and is foundational to building genre knowledge.

Participants' understanding of the RWT feedback and reported desire to use the RWT again for draft revision present further optimistic findings. As learners return to the RWT, interact with the functional feedback, and make revisions to their drafts, they become increasingly familiar with the writing conventions typical of published research in their discipline, thereby socializing themselves into a community of practice; a willingness to revise using the analyzer's feedback, explore Demonstration Module examples, and compare their own writing to published works in their disciplines absorbs students in a process by which they are becoming socialized into the research article genre by essentially *doing* research discourse (Dewey, 1966).

Appraisal (Quantitative +Qualitative) Analysis for RQ1a

The systemic functional analysis of participants' qualitative data — open-ended responses on the post-task survey and transcripts of stimulated recalls — revealed that overall, learners found the RWT to be useful as represented in their positive evaluations of the tool and its automated feedback. The analysis also showed these RWT users were equally optimistic about the future potential of the RWT, remarking heavily on the projected usefulness of the tool as the accuracy of the analysis and feedback are improved. What follows is a breakdown of each Appraisal resource analysis targeted at participants' perceptions of the usefulness of the RWT, then a discussion of the SFL analysis results answering RQ1a. The results from the *appreciation* resource analysis and analysis of the resources participants used to *engage* in their evaluation of the RWT usefulness are presented first. Next, findings from the analyses of *graduation* resources used to convey *appreciation* and *engage* interlocutors in the RWT evaluation are presented along with their corresponding *appreciation* or *engagement* resource categorizations. Results from the *affect* analysis are presented following the report of *appreciation* analysis findings. Results of the frequency counts of each Appraisal resource tallies (quantitative results) are then presented, and a detailed description of the types, charges, and examples of each resource (qualitative results) is expounded. Findings per data set are reported by group total as well as broken down by individual participant where possible. Interpretation of the qualitative results per each analysis accompanies the report of findings.

Appreciation analysis for RQ1a. Analyses of participants' use of *appreciation* resources in evaluating the usefulness of the RWT showed an overwhelmingly positive evaluation of the RWT, the RWT feedback, and learners' RWT draft revision experience. This subsection concentrates first on results from the open-ended survey response data analysis of *appreciation,* then on those resources used in the stimulated recalls. A discussion of the results of this analysis follows.

Appreciation analysis of open-ended survey responses. Analysis of learners' open-ended responses on the post-task survey revealed learners' positivity in their judgments of the RWT's usefulness. Table 4.1-2 below shows a breakdown of the frequencies of the positive, negative, and neutral *appreciation* resources used by participant as well as group totals in the open-ended survey responses. The columns labeled "projected positive" or "projected negative" show total tallies for resources used to convey *appreciation* of the RWT, RWT feedback, or RWT experience in an imagined or conjectured scenario possibly in the future. Adding this projected positive or negative classification allowed the researcher to attend to and assess expressions such as "I think [the RWT] *would be helpful*" (P6), which conveys a positive tone, but assumes a projected or forecasted situation, rather than the current circumstances or condition of the RWT.

Table 4.1-2

Frequency Count for Appreciation Resources in Open-Ended Survey Responses

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Appreciation* Resource Total
P1	2	0	2	0	0	4
P2	0	5	0	0	0	5
P3	1	2	0	0	0	3
P4	1	0	5	0	0	6
P5	3	1	2	0	0	6
P6	0	5	0	0	0	5
P7	2	1	2	0	0	5
P8	2	0	0	0	1	3
P9	1	1	0	0	0	2
P10	2	0	0	0	0	2
P11	1	1	0	0	0	2
TOTAL	15	16	11	0	1	43

Tallies of the positive and negative *appreciation* resources in the open-ended survey responses displayed in Table 4.1-2 show that most participants conveyed positive *appreciation* of the “trigger” — the RWT, RWT feedback, or theme pertinent to the learners’ RWT experience. Only one participant (P4) expressed more negative *appreciation* of the RWT, and one participant (P1) evaluated the RWT with an equal amount of positive and negative *appreciation*. There was only one neutral *appreciation* of the RWT, which will be described in the following paragraph. As a whole, the positive and projected positive *appreciation* of the RWT, feedback, and the analysis experience totaled 31 out of the *appreciation* resource total of 43, while just 11 of the 43 were charged negatively. With 72% (31 out of 43) of the *appreciation* resources used being positively charged, sheer numbers from participants' open-ended survey responses suggest a strong trend towards positive *appreciation* of the RWT.

The actual *appreciation* resources used in the open-ended survey responses centered primarily on issues of comprehensibility, clarity, and accuracy of the RWT feedback and functionality, applicability, and usefulness of the RWT tool. Interestingly, all negative *appreciation* resources used in learners' open-ended survey responses solely pertained to the accuracy of the RWT feedback. Adjectives like "incorrect" (P4 and P5), "wrong" (P4), "off" (P7), "lacking" (P7), and "misinterpret[ed]" (P1) were used to evaluate the RWT feedback. Participant 4 described the "wrong detection" of the step she intended to be the "biggest problem" with the tool, pointing to the participant's awareness that the feedback did not match her intended meaning. Participant 1 noted that she "did not agree...when RWT gave [her] feedback about the communicative goal of a specific sentence." Also, the only neutral *appreciation* resource used also concerned RWT feedback accuracy. The single neutral expression was conveyed by Participant 8, who noted the likely inaccurate RWT analysis was "half my fault."

The value and projected future value of the RWT and RWT feedback were communicated in study participants' use of positive and projected positive *appreciation* resources in the open-ended survey responses. Positive resources such as "beneficial" (P1, P7, and P9), "useful" (P4), and "helpful" (P6 and P7) were used to evaluate the RWT feedback, whereas resources like "good" (P2), "great" (P2 and P6), and "helpful" (P6 and P7) were used to project future positivity towards the feedback. Some participants called attention to particular features of tool in their positive evaluations. Participant 10 mentioned "the part that [identifies] the moves that you have and the ones that are missing" was useful.

Participant 4 stated she found the “pie chart and word count…useful” and Participant 7 wrote it was “helpful” for her “to see things broken down by moves and steps.” Participant 9 positively evaluated the Demonstration Module, asserting the example sentences for every individual step” were “beneficial.”

The RWT was also evaluated positively in the open-ended survey responses for its capabilities in facilitating learners’ draft revisions. Participant 3 found “being able to change the text and then re-analyzing the text” was helpful, and also that the use of the RWT for draft revision would allow him to “make more efficient use of my time.” Participant 5 mentioned it was useful for her to see “how I could improve each sentence to make it clear what I want to say.”

Students also referenced the RWT’s usefulness in terms of the tool prompting them to re-examine the rhetorical intentions throughout their drafts. Participant 5 reported the RWT made her “think about what I want to say and how I will say it,” while Participant 6 stated it was useful “having the availability to view both what it says and what you think it is.” Participant 1 also affirmed the RWT made her “think to see if I haven’t expressed my goal clearly,” and Participant 11 said it was useful that the RWT “[tells] you the function of sentence, so you can see if you did express well or not.”

There was also a great amount of enthusiasm about the potential usefulness of the RWT for the novice research writers. For instance, Participant 3 mentioned the RWT’s “interactive editing along with analysis will help” him in future revisions. Many of these comments focusing on the future potential helpfulness of the tool drew on specific features that could be integrated into the RWT. For example, Participant 6 remarked that “being able to edit in the colored section would be great.” Two participants recommended a broadening of the disciplines represented in the RWT corpus. Participant 7 stated it "would be helpful if my exact discipline (Nutritional Sciences) were available" and Participant 9 hoped "the discipline list" could be "extended." Yet another learner (P2) believed the inclusion of "statistics" detailing the results of the student textual analysis would be "great."

What is striking from the *appreciation* resource analysis is learners' strong positive evaluation of the RWT in terms of the comprehensibility, clarity, functionality, applicability, and usefulness of the tool; each of these elements are acknowledged by the Technology Acceptance Model (Davis, 1989) in information systems theory as crucial factors in users' reception and adoption of new technology. Therefore, study participants' positive perceptions about usefulness, ease of use, and easy interpretation of the feedback are encouraging in consideration of how current and future RWT users will receive and adopt the RWT for draft revision.

Unsurprisingly, learners negatively evaluated the RWT's usefulness with connections to statements about inaccuracy of the RWT feedback. In fact, all negative *appreciation* resources used in learners' open-ended survey responses solely pertained to feedback inaccuracy. Accuracy in AWE feedback is indeed critical to the evaluation of automated systems for language learning contexts and has been the concentration of much research into uses of automated feedback for formative and summative writing development (Chen & Cheng, 2008; Warschauer & Ware, 2006). The literature has shown that learners acknowledge many of the same limitations that L2 learning researchers recognize with AWE feedback, such as systems' exaggerated preferences for longer texts and higher numbers of transition words, the inability to recognize more subtle logic or content development, the discouraging of nontraditional and creative essay construction, and inaccuracies of the feedback. What is more, Chen and Cheng (2008) assert that AWE feedback inaccuracies could negatively influence negative writers' use of AWE systems by promoting learner preference for human feedback as opposed to automated feedback, with the assumption being that human (instructor or colleague) feedback is more accurate.

Accuracy of the feedback aside, it has also been shown that learners can only truly reap benefits from interaction with AWE tools when the feedback is clear, usable, and timely (Shute, 2008), all RWT characteristics cited by participants in this study. Timeliness of AWE feedback is particularly essential, as has been observed by researchers in the field of applied linguistics and beyond. Grimes and Warschauer (2010) believe the instantaneous nature of automated feedback is involved in increasing students' motivation to revise their drafts. The authors further posit that the type of immediate AWE feedback learners receive, be it numerical or rubric-based scores or feedback on specific grammatical constructions, spurs AWE program users to become more self-motivated and make more autonomous revisions.

Receipt of the type of automated immediate feedback the RWT provides can also be related to what psychologist Jeff Howard (in Raney, 1997) refers to as "The Nintendo Effect," a notion deriving from the scenario of children playing video games and responding to feedback provided by the system. Howard contends that the immediate, accurate, and incremental nature of such programmed feedback stimulates a degree of engagement that is not unlike a trance, especially when the interaction occurs for prolonged periods of time. Rather than passively consuming visual data (e.g., television or movies) or aural data (e.g., music), interaction with systems can aid in improving users' aptitudes and abilities as they exercise power and make decisions in the moment. Relating Howard's described effect to how language learners use the RWT, the immediate, individualized feedback offered by the

RWT analyzer encourages engagement and intensive focus on draft revision. As the learners obtain the RWT's instantaneous feedback, they may be further motivated to revise their section draft and submit the revisions to the analyzer in the same way players of a videogame utilize a system's feedback as a catalyst for level advancement (Suite, 2007). Additionally, as RWT users make choices and exercise power to interact with RWT feedback or a module in a minute-by-minute manner, it encourages precipitous growth of their skills in identifying genre conventions of the discipline and recognizing the functions realized in the lexicogrammar of their own texts.

The RWT prompting participants to revisit their writing is a positive result as it shows the writers want to ensure they have expressed their goals clearly in their writing. The reviewing and revising processes participants mention is ultimately the goal of the RWT, a tool which aims to assist students attend to the functional relationships between the provided text and the text's purpose, a feature New Rhetoric asserts as fundamental to learning a genre (Coe, 2002; Hyon, 1996). In other words, RWT users' return to their text to make modifications to the drafts shows the learners' desire to understand how their drafts achieve the communicative purposes dictated by the text's context and genre of use.

Participants expressed much willingness to provide suggestions for improving the AWE program in their positive *appreciation* of the current and projected future value of the RWT. Specifically, the enthusiasm RWT users felt about future potential usefulness despite the accuracy issues pertained to their desire to have their precise discipline represented in the RWT corpus (in the Demonstration Module and for performing cross-analysis with their drafts) and a greater number of feedback options. Fang (2010) maintains learners' favorable attitudes towards an AWE program can be linked to their perceptions of how useful the tool is and will be, not only for themselves, but also for other students in similar learning environments. In this study, participants' enthusiasm about the current and future projected states of the RWT in the form of making recommendations about the RWT's improvement could be perceived potentially as participants' investment in helping create a program that is useful not only for them, but also for other novice research writers.

In addition, learners' recommendation to include more disciplines in the RWT's corpus demonstrates an inclination to contextualize their text within their scholarly community. This finding shows that the RWT users recognize how their draft is interconnected with other published research in their field; language learners' acknowledgement that their writing is conceptually embedded in relevant social and cultural contexts suggests they accept the intertextuality of their writing and writing in their academic communities (Barton & Hamilton, 1998). It also implies that the participants comprehend the community-oriented nature of their writing and that their participation in the research article genre is an active and social process (Halliday, 1989).

To determine the intensity of learners' evaluation of the usefulness of the RWT and their use of the RWT, *graduation* resources that participants used to scale their *appreciation* were also analyzed. Table 4.1-3 displays a frequency count for individual participant use and overall group use of *graduation* resources in *appreciation* in learners' responses on the open-ended survey.

What is clear from the table is that while few resources were used to grade participants' *appreciation* of the RWT or their RWT experience in the open-ended survey response data, more resources were used to grade negative *appreciation* over positive *appreciation*. Participants 4 and 7 both used *graduation* resources (two each) to scale their

Table 4.1-3

Frequency Count for Graduation of Appreciation in Open-Ended Survey Responses

Participant	Positive	Projected Positive	Negative	Projected Negative
P1	0	0	0	0
P2	0	0	0	0
P3	0	1	0	0
P4	0	0	2	0
P5	0	0	0	0
P6	0	0	0	0
P7	0	0	2	0
P8	0	0	0	0
P9	1	1	0	0
P10	0	0	0	0
P11	0	0	0	0
TOTAL	1	2	4	0

negative evaluation of the RWT, while only one *graduation* resource was used to scale a positive *appreciation* of the tool, and two were used to grade a projected positive evaluation, as will be discussed below.

To better understand the grading of learners' evaluations, the *graduation* resources learners used to *appreciate* the usefulness of the RWT and the RWT feedback underwent one final analysis. Guided by previous analyses of *graduation* resources (Economou, 2009; Liu, 2013; Martin & White, 2005), participants' *engagement* resources used to *appreciate* the RWT's usefulness were classified as low, medium, or high based on the force with which they strengthened or weakened the expressed *appreciation*. This allowed determination of the strength of learners' evaluation. For example, Participant 4 used medium and high-ranked *graduation* resources to scale her negative evaluation of the tool, remarking "It really [med. *graduation*] has to improve [-*appreciation*] its accuracy" and "The biggest [high *graduation*] problem [-*appreciation*] I had was wrong detection." Participant 7, who also used *graduation* resources only to scale her negative *appreciation* of the AWE tool, stated "Some of the interpretations of the computer were significantly [med. *graduation*] off [-*appreciation*]," and "disciplines completely [high *graduation*] lacked [-*appreciation*] examples to compare with." In these provided examples from both participants, medium and high-grade resources were used to strengthen Participant 4 and 7's negative evaluation of some aspect of the RWT. Conversely, Participant 9 used only two *graduation* resources (both medium-graded) in her survey responses, each expressed with a positive or projected positive charge to the evaluation. She believed that "Example sentences for every individual step were very [med. *graduation*] beneficial [+*appreciation*]" and also suggested that "The discipline list can be more [med. *graduation*] extended [proj. +*appreciation*]." It should be noted there were no *graduation* resources which were ranked as expressing a low grade or scale of evaluations for either positive or negative RWT evaluations. In other words, in the open-ended survey responses, *graduation* was only expressed when it was used to intensify participants' *appreciation* to a medium or high degree.

That only medium- or high-graded resources were used to intensify learners' *appreciation* of the RWT may show that learners only responded to the post-task survey items if they felt strongly about their opinion of the RWT or their RWT experience. In other words, if the participants only felt mildly negative or positive about their RWT experience, they may have either not used *graduation* resources or not answered the open-ended question whatsoever. What is also interesting in the *graduation* analysis of these post-task survey items is that the resources were used only for negatively appreciating the RWT. This may indicate that the participants felt negatively enough about their RWT experience or the RWT that they wanted to convey this strongly in their survey response through the use of medium- or high-graded *graduation* resources.

Appreciation analysis of stimulated recall data. Findings from an *appreciation* analysis of the stimulated recall data mirrored those of the open-ended survey responses in that participants conveyed more positive evaluation of the RWT. As can be seen from Table 4.1-4's breakdown of the frequencies of positive, projected positive, negative, projected negative, and neutral resources used in the stimulated recalls, learners evaluated the target "trigger" — the RWT, RWT feedback, and learners' first RWT experience —more positively than negatively or neutrally. Positive and projected positive *appreciation* of the "trigger" accounted for 60% (269 out of 451) of the total evaluations, while negative *appreciation* comprised 39.4% (178 out of 451) and neutral *appreciation* representing 0.01% (4 out of 451) of the evaluations.

Table 4.1-4

Frequency Count for Appreciation Resources in Stimulated Recalls

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Appreciation* Resource Total
P1	22	8	6	0	0	36
P2	29	1	11	3	0	44
P3	16	7	11	0	2	36
P4	10	2	15	0	0	27
P5	30	7	13	0	0	50
P6	22	7	28	1	0	58
P7	7	4	27	1	1	40
P8	33	2	19	1	1	56
P9	28	6	15	0	0	49
P10	16	0	18	0	0	34
P11	11	1	9	0	0	21
TOTAL	224	45	172	6	4	451

Individual participants, however, were divided in their positive and negative perceptions of the RWT's usefulness, as exhibited in varied trends in their usage of positive and negative *appreciation* resources. Three (P4, P7, and P10) of the 11 participants (27%) were more negative than positive in their evaluation of the RWT, RWT feedback, and their RWT experience. The frequency of their use of these negative resources also varied; Participants 4 and 10 evaluated their RWT experience and the tool and its feedback slightly more negatively than positively, while 70% (28 out of the 40) of the total *appreciation* resources used by Participant 7 were negatively charged. One participant (P6) used an equal number of positive and negative *appreciation* resources (29 for each) in her evaluation of the RWT and RWT experience. Most of the participants, however, conveyed more positive than negative evaluation of the RWT. This positive evaluation also varied by participant with some learners (P2, P3, P8, and P9) using approximately twice as many positive as negative *appreciation* resources, another (P5) using around 75% positive resources in the total resources used, and another (P11) using slightly more than half (57%) positive *appreciation* resources over negative resources. Participant 1 conveyed the most positive *appreciation* of the RWT with 83% of her *appreciation* of the "trigger" being positive.

Mirroring findings from the open-ended survey responses concerning participants' evaluation of the RWT and RWT feedback, judgments of the RWT's usefulness conveyed in the stimulated recalls also focused on accuracy and clarity of the feedback, convenience and usability of the tool, and the effect and the anticipated impact that working with the RWT would have on the students' writing. What varied from the findings of the analysis of open-ended survey responses was an increased enthusiasm for potential usefulness of an improved version of the RWT as well as an extension of detailed recommendations for how the tool could be improved.

There were several general trends in participants' negative *appreciation* of the "trigger" (RWT, RWT feedback, and the RWT experience). Most negative resources, not surprisingly, were used to assess the RWT feedback, and pertained to aspects of feedback accuracy. Many students mentioned they did not agree with the feedback (P1, P5, P7, and P10). They believed some of the analysis was "contrary to what I thought" (P3), "not correct" (P5), or that there were "discrepancies" in the student's understanding and the RWT's understanding of a rhetorical move or step (P8).

A number of students even used the same exact words to describe the RWT analysis accuracy as an "issue" (P3, P6, and P7) or a "problem" (P1, P4, P8, and P9), or even being straight out "wrong" (P4, P6, and P10). Once convinced the feedback was incorrect, or when "it doesn't make sense" (P6), the mislabeled feedback forced some students to "skip" (P9), not to "read seriously" the feedback (P10), or "not pay any attention" (P9) to certain parts of the RWT feedback.

Another element sparking negative evaluation of the "trigger" was the lack of representativeness of disciplines in the RWT corpus. Participant 6, who used an equal amount of positive and negative *appreciation* resources, primarily geared negative criticism of the tool towards the lack of her discipline in the RWT corpus. She stated her disciplinary corpus was "empty" and "missing," and that there was "nothing to show" when she looked for examples directly from her field. Participant 6 commented that the disciplines available were "not close" to her discipline, while others remarked about the "fit" of the available disciplines, noting that "none fit perfectly" (P2) or the ones offered "did not fit [my] discipline" (P2). This lack of representativeness of all students' disciplines was considered "weird" (P8), "not helpful" (P10), and "limited" or "limiting" (P3 and P8). Participant 5 used *appreciation* resources aimed at criticism of the feedback, saying the "misanalyzed" feedback was "a big concern," and the feedback needs to be "accurate," or at least "higher." Participant 1, who used the least amount of negative *appreciation* resources, acknowledged that the RWT feedback was "limited" and it "didn't recognize" what she was trying to accomplish.

The RWT tool's usefulness was also negatively evaluated by participants who encountered "difficulty" (P2) when using the tool. Some students stated they experienced "trouble" when using the RWT (P5 and P6), another came across "formatting issues" (P8) in his draft revision, and one student experienced a "crash" (P4) of the analyzer when analyzing her draft. Participant 3 mentioned it "take[s] a couple tries" (P3) to grow accustomed to the functioning of the tool, and some aspects were seen as "confusing" (P3 and P4) or "tricky" (P7).

How individual study participants negatively evaluated the RWT's usefulness differed. The three participants who expressed more negative *appreciation* of the RWT (P4, P7, and P10) voiced the most criticism about the Analysis Module. Participant 4 had particular problems with understanding the feedback, stating the numbers in the pie chart were "weird," that understanding the feedback was "complicated," and the means for navigating through drafts was "confusing." Participant 10 made more general comments about how software like this "makes mistakes" and recognized "the computer can't tell" someone's intended meaning. Participant 7, whose negative evaluation of the RWT totaled 28 out of her 40 total *appreciation* resources, concentrated her criticism on "misidentification" of the proper, intended step and how there "wasn't much of anything" in the RWT corpus, in reference to the corpus lacking her particular discipline. Frustrated with the continual "mislabeling" and "misinterpreting" of steps and moves, she remarked continuing the analysis "wasn't worth my time," so she "gave up trying" to modify her sentences to get the anticipated RWT analysis.

As earlier observed in the open-ended response data, the RWT analyzer's inaccurate feedback production seemed to be the focus of negative RWT *appreciation* by P2, P3, P8 and P9 and P11, all of who expressed more positive than negative *appreciation*. The presence of certain misidentified steps, like *Identifying the niche,* by the RWT analyzer was "low" for Participant 3, who further argued the RWT "simply doesn't recognize" what he was hoping it would with his writing. Participant 2 remarked the feedback "wasn't 100% accurate" and Participant 8 stated he "wasn't sure it was working right." For Participant 11, the pie chart proportion showing the distribution of Moves proved to produce "difficulties," and this student "gave up" when he realized the RWT analyzer "couldn't identify my idea." Participant 9 believed there to be a "misunderstanding" between what she and the RWT thought the step should be labeled, and that the word count numbers were "not realistic."

Only four of the 451 total *appreciation* resources were neutral, signally learners did indeed form distinctly positive or distinctly negative (of a combination of the two) perceptions of the RWT's usefulness. These neutrally charged resources were reactions to particular aspects of the RWT and the RWT itself. Participant 3 felt the RWT's evaluation of a particular sentence in his text was "on the line," as he could somewhat understand why the tool analyzed the text the way it did. When responding to a question about the usefulness of the RWT, Participant 7 responded that her reaction was "mixed," though she went on to describe the positively projected potential for the AWE tool in the future. Due to the low number of neutral resources, however, no notable trends in the responses were observed. The low number of neutrally charged *appreciation* resources in participants' *appreciation* of the RWT's usefulness point to the fact that learners primarily were settled on positive or negative perceptions of the RWT, RWT feedback, or their RWT experience.

Learners perceived the RWT's helpfulness and convenience of the tool and its feedback as a positive feature of the AWE program's usefulness. Positive and projected positive *appreciation* resource use also pointed to learners' optimism about future usefulness of the RWT. All participants explicitly regarded the RWT "helpful" (P1, P2, P3, P5, P6, P8, P9, and P11), "useful" (P1, P2, P3, P4, P7, P8, and P10), "beneficial" (P1), or "practical" (P6). Also, while a number of participants negatively discussed their disagreement with the RWT feedback provided in the Analysis Module, there were also several participants (P5, P7, P9, P10) who dually noted agreement with the RWT feedback.

Ease of use was another common theme in learners' positive *appreciation* of the usefulness of the RWT. The AWE tool was described as "convenient" (P1, P6), "easy to use" (P2, P3, P8), "straightforward" (P8), and clear" (P11). Participant 3 noted that "even someone with my limited skill set ….could benefit" from use of the RWT, suggesting those with limited technological backgrounds would have little problems using the tool for draft revision; he further elaborated that realizing the tool's usefulness was simply a "matter of becoming familiar with [the RWT]."

Aesthetics were considered an integral part of the attractiveness of the interface. Two students evaluated the RWT website as "catching [their] eye" (P2 and P8), with the color-coded portions of text and feedback in the Analysis as well as Demonstration Module being seen as particularly “interesting” (P5, P6, and P8) and even “beautiful” and “artistic” (P10). Remarkably, the pie charts stood out as a major *appreciated* RWT feature, being evaluated positively as “colorful” (P9), “helpful” (P11), and “important” (P2).

The usefulness of the RWT was frequently linked to the tool’s ability to uncover aspects of students’ writing of which they were previously unaware. The tool “caught things” Participant 6 remarked she was not recognizing in her own writing, and in that way, “gives you a different perspective” (P8) or “one way of looking at my text” (P5). The feedback also appeared to identify knowledge gaps in students’ understanding of the moves and steps. Participant 7 noticed the RWT helped her “to catch that and address something I truly did need to learn further” (P7). The feedback helped “give me a good indication of what to review” (P2) and pointed students in the direction of what particular aspects needed further revision; as Participant 9 remarked, she “started to pay attention” to “verbs and which structure should be important.”

Not only did the RWT feedback help in distinguishing knowledge gaps or highlighting potential parts to revise, but also helped facilitate learners’ deeper engagement with the meaning of the text. It makes Participant 9 “look carefully” at the text, as she reflected, and using it consistently “would help me” in “trying to figure out the problems” in conveying intended meaning, Participant 3 asserted. Forcing students to return to their texts “[makes] you sit back and [makes] you think what you are saying” (P4), “rethinking and trying to see what I meant” (P4), and maybe even helped to “confirm in my head” (P6) what a writer intended to mean in a passage. Furthermore, engaging students in being interactive with the text by “giving feedback” to the RWT in the thumbs up/thumbs down feature —

marking agreement or disagreement with the analysis results —“helped me think about my own sentence” (P1).

Positive evaluations of the RWT’s usefulness also concentrated on the effectiveness of the Demonstration Module, which was described as “great” (P1) and “helpful” (P10), in that it provided “good” (P2) and “a ton of” (P6) examples. The Demonstration Module prompted one student to look at the examples “carefully” (P9), and allowed others to search for specific aspects of section-specific RA writing with which they struggled. For example, Participant 11 thought the concordancing tool “provided some good sentence structure” examples. Another student whose corpus was not represented in the RWT corpus wished to have her discipline available, considering it would be “helpful having specific examples [in my field]” (P7). Even the organization of the concordancing tool available in the Demonstration Module was evaluated positively by Participant 8 who stated it “makes sense” to him.

The improvement of particular RWT features or the integration of software capabilities to aid draft revision were additional concepts emerging in projected positive *appreciation* of the RWT”s usefulness. “Saving my article with a name...might add to the interactive feature,” Participant 1 suggested. This participant also proposed that “a tutorial, or a demonstration…. would help.” Substituting “a drag-and-drop feature” for RA section downloading would “eliminate waiting,” Participant 3 recommended. Yet another participant suggested the RWT “be modified for us to notify the right grammar” (P5), advocating for the inclusion of a grammar-checking feature.

What permeates the *appreciation* analysis are indications of students’ willingness to use the RWT again. Participant 5 affirmed the RWT would be a “good study point” for her in her draft revision, especially if she were to see her own discipline included in the corpus. Participant 2 was optimistic the RWT would “help me trying to figure out the problems” she experiences in RA writing. Still there were some stipulations to this future RWT usage, such as that suggested by Participant 4 who noted she “would use it…in addition to a person.”

An assortment of themes was present in individuals’ positive evaluations of their RWT experiences. The three learners who were more negative than positive in their *appreciation* of the RWT (P4, P7, and P10) evaluated both parts and the whole of the RWT in positive ways. Participant 4 mentioned specific features that were “good,” including the overall assessment part of the Analysis Module and the “pie charts and percentages.” After concentrating much of his evaluation on the limitations of the software, Participant 10 finished his stimulated recall with a string of positive remarks about how he *could* use the RWT and where the tool’s potential lie; he stated it would be “good” for the “software to do a first identification or analysis of what's going on in my draft” and that, while he would not rely on the RWT for a completely accurate analysis of his text’s meaning, the RWT does indeed provide “a good reference.” Participant 7, who was least positive in her evaluation of the AWE tool conceded the RWT did “a good job with the moves,” and found the visuals, especially the pie charts, as “useful.” Participant 6, who used an equal number of positive and negative *appreciation* resources made a number of evaluative comments about the functioning of the RWT. Once she thought she understood how the RWT was analyzing some of her sentences, she saw the tool as “starting to realize” the function she intended, and that it would “notice references more clearly” if she manipulated text in a certain way.

Other participants who were generally more positive in their evaluations of the RWT’s usefulness detailed explicit tool features they found useful. Participant 2 noted a number of features she found particularly "helpful" with the interface, stating the "graphics" makes understanding the analysis "faster" and allows her to "grasp the concept" of the feedback. Participant 3's stimulated recall was full of projected positive *appreciation* of the RWT in a more developed state; he stated that "synchronized edits" would be "efficient" and that the improved tool will be "good" once the developers "get the kinks out." Participant 5 was especially complimentary of the RWT's ability to encourage her to reexamine the rhetorical intentions of her writing. The feedback "makes you think more about what you intended to write" and "gives you an initial point of thinking," Participant 5 said. Usability features were a central point of evaluation for Participant 8, who believed the tool was "not complicated" and that it "wouldn't be difficult" to use "for people that aren't very familiar with computers." Participant 9 geared much of her positive evaluation of the RWT to the Analysis Module, reporting she enjoyed that the feedback was "specific" and that this individualized feedback was "important to me." Positive evaluative remarks by Participant 1, who was the most positive in her *appreciation* of the RWT, revolved around her upbeat attitude about the usefulness of the RWT, articulating it "can only improve" my writing. The adjective "positive" was uttered three times by Participant 1 in her stimulated recall, specifically in reference to her positive attitude about the program, the feedback's positive effect on her writing, and her positive experience with the RWT for revising her draft.

In sum, learners' were more positive than negative in their evaluations of the usefulness of the RWT and RWT feedback, as revealed in an analysis of *appreciation* resources in both open-ended post-task survey and stimulated recall responses. While there was a higher percentage of negative and projected negative *appreciation* resource use in the stimulated recall data as compared to the open-ended survey response data, participants were generally more positive in their evaluations of the AWE tool. The types of *appreciation* resources used for both negative and positive evaluations were also similar, with negative resources touching on issues of inaccuracy of the RWT feedback and positive resources centering on usefulness and ease of use of the tool.

Participants' sparse use of neutrally oriented *appreciation* resources shows that learners did indeed develop positive or negative opinions of the RWT and their RWT experience. *Appreciation* resources that were not neutral comprised a mixture of positively and negatively charged evaluations of the RWT and participants' experience with the AWE tool for draft revision.

Negative evaluations of the RWT's usefulness were communicated in reference to "issues" or "problems" with the RWT feedback not recognizing what meaning the writer had intended; a citation of the "problems" with the feedback led some learners to question the functioning of the RWT analyzer and uncertainty about whether "it was working right" (P8). Unfortunately, if the participants continued to encounter these "issues" or when the feedback was recognized as inaccurate, some aimed to "skip" or "give up" working with an RWT feature or disregard portions of the feedback.

Other negative *appreciation* of the RWT's usefulness was linked to the lack of representativeness of the RWT corpus; this finding, however, could be perceived as positive for RWT developers in that learners whose disciplines were not represented in the corpus found enough value in the Demonstration Module examples that they wanted to explore those examples in their own disciplines. Instead of providing decontextualized sentences to learners searching for examples of research writing, the RWT's Demonstration Module concordancer supplies users with authentic examples of the Moves and Steps from actual published discourse in their discipline while maintaining the texts in their lexical environments and allowing learners to observe the pragmatic significance the sentences achieve (Widdowson, 2002). Study participants' desire to have their disciplines represented in the RWT corpus suggests they value the ability to explore examples from published research and want to be able to conduct these explorations on articles more closely aligned to the type of writing they will be producing in their respective fields; as these RWT users engage in comprehensive analyses of genre writing within their disciplines, they may then apply this knowledge as they compose their own academic writing in the genre (Barlow, 2004; Cortes, 2007; Sinclair, 2004).

Still most evaluations of the RWT's usefulness in the stimulated recall data were positive, with over twice as many positive as negative *appreciation* resources used by participants to evaluate the RWT and their use of the RWT for draft revision. Similar to the results for the analyses of open-ended survey responses, positive *appreciation* in the stimulated recall data was connected to comments about the RWT's ease of use, learners' enthusiasm about potential uses for tool, and the convenience of the RWT. Ease of use is particularly important, as this is the basis for determining the usability of an application. In HCI research, a technology is considered usable if is fosters quick, easy, and effective use (Shackel, 1991). A central component to this designation is that the technology must be usable to first time users (Nielsen, 1995). Because participants in this study were first time users of the RWT, it is a promising finding that these learners found the RWT easy to use to revise their drafts.

In addition to ease of use, HCI scholarship further recognizes that the technology's users must confirm that the website, software, or tool offers them what they want (Nielsen, 1995). In this study, learners continually cited the RWT as being a helpful source of feedback and as prompting them to question their rhetorical intentions. The RWT is thus giving students what they want by providing individualized feedback that directs them towards modifications as they incorporate Moves and Steps in their drafts. From an ESP perspective, this suggests the RWT is helping to foster intense examination of the drafts as learners work to situate how their writing follows or deviates from the conventions of the genre in their research community (Dudley-Evans, 2000). Using the RWT's suggested revisions, RWT users can revise their drafts in consideration of genre norms and transition from the telling of knowledge to the transforming of knowledge as they engage in their academic discourse community (Berkenkotter & Huckin, 1995; Tardy, 2005).

The inclusion of graphical feedback in the RWT interface was also positively *appreciated* by participants. The visual feedback, referenced as pie charts, the Move range bar, and the Step-level color coding of the analyzed texts, was considered useful by many participants and helped the RWT users "grasp the concept" (P2) of the feedback more easily. Visual appeal is yet another important factor in determining technology's usability (Nielsen, 1995). Because the RWT users indicated a desire to revise their written texts with the RWT in the future and because it has been determined that the use of appropriate visuals facilitates enhanced ease of use for returning users (Nielsen, 1995), it would be interesting to conduct follow-up research on these participants to observe how they comprehend, navigate, and manipulate RWT features during subsequent uses of the AWE program.

In addition to mentions of the RWT being "beneficial," participants also mentioned RWT's practicality, a key feature in Chapelle's (2001) evaluation framework for CALL applications. According to this learner-centered CALL evaluation framework, CALL tools are deemed effective when they fit the learner in a specified learning environment. Practicality is among the six conditions Chapelle proposes that work to establish a tool's effectives; others are language learning potential, learner fit, meaning focus, authenticity, and positive impact. HCI research, too, mentions users' ability to perform the specified task efficiently as a key to an application's usability (Nielsen, 1995). Participants' positive *appreciation* of the RWT as being a practical tool further contributes to its usefulness as a CALL application in academic discourse instruction.

Authenticity, another component of Chapelle's (2001) framework for evaluating CALL applications, is a characteristic of the RWT's Demonstration Module that participants evaluated positively. Results showed the authentic examples from actual published research helped the RWT users clarify their understandings of the how arguments are developed in authentic discourse in their disciplines. From ESP, New Rhetoric, and SFL perspectives, the process by which learners access examples from exemplary work in their disciplines demonstrates a transformation from novice to expert academic writers through a process of socialization into research article writing by *doing* academic discourse (Halliday, 1978). Furthermore, by accessing authentic Demonstration Module examples RWT users are propelled to engage in bottom-up textual analysis on contextualized research writing as they examine the specific linguistic features that realize functional Moves in Introduction section writing (Cortes, 2007).

The main distinction between learners' evaluations of the RWT effectiveness in the open-ended survey responses and the stimulated recall data was the spike in suggestions for improving the RWT. The absence of additional help resources the participants mentioned they would like to add to the RWT may also have encouraged their noticing of features. For example, one feature students highly recommended be added to the RWT was a grammar checker, similar to that provided in the AWE tool *Criterion* (ETS). The lack of a grammar checker in the RWT, however, may have compelled students to more carefully review their grammar. Cotos (2011) and Hyland (2003) assert that an objective of using AWE in writing instruction should be to help develop students' strategies for recognizing both strong and weak aspects of their writing. The RWT's lack of grammar checkers or other such integrated writing assistance tools may force students to be more cognizant of their writing's strengths and weaknesses, and thereby oblige students to build strategies for recognizing the strengths and weaknesses in their own writing.

An analysis of language participants used to scale their evaluations of the RWT and their RWT experiences in terms of usefulness showed an increased use of *graduation* for intensifying learners' positive evaluations in the stimulated recalls. Table 4.1-5 displays the tallies for individuals' use of *graduation* resources as well as totals per category of charged *appreciation*. As can be seen in the table, 97 (61%) *graduation* resources were used to scale participants' positive *appreciation* of the RWT's usefulness, while 61 (39%) were used to *graduate* learners' negative RWT evaluations. Also evidenced in Table 4.1-5 are the varied patterns in participants' usage of *graduation* resources in their RWT *appreciation*. Participant 4, for example, used only seven *graduation* resources, and Participant 11 just eight. By contrast, Participant 9 used 27 *graduation* resources, nearly four times the amount of resources used by Participant 4.

Taken alone, Table 4.1-5 shows learners' tendency to scale their positive *appreciation* of the RWT more often than they scaled their negative *appreciation* of the tool; however, adding an element to the analysis showing the degree of scaled *appreciation* (low,

Table 4.1-5

Frequency Count for Graduation of Appreciation in Stimulated Recalls

Participant	Positive	Projected Positive	Negative	Projected Negative
P1	9	2	0	0
P2	7	0	6	0
P3	4	3	3	0
P4	0	0	7	0
P5	6	1	0	4
P6	11	4	6	1
P7	3	1	10	1
P8	11	1	9	1
P9	19	5	3	0
P10	6	0	6	0
P11	4	0	4	0
TOTAL	80	17	54	7

medium, or high) would yield results that may highlight how tentative or confident learners were in making judgments about the RWT or their RWT experience. Table 4.1-6 provides a breakdown of the grade of the *graduation* resources and is categorized by the charge of the evaluation.

Table 4.1-6

Graduation Resource Rank by Appreciation Charge in Stimulated Recalls

Appreciation Charge	Low	Med.	High
Positive	31	57	9
Negative	28	28	5
TOTAL	59	85	14

What Table 4.1- 6 clarifies is how the *graduation* resources were used to strengthen both positive and negative RWT evaluations. As the table shows, the grade of the *graduation* resources varied among charges. It seems that overall, resources used to intensify *appreciation* the most (high) were used sparingly by participants in both their positive and negative evaluations of the RWT. Resources used to only slightly intensify learners' RWT *appreciation* (low) were employed in relatively equal amounts in relation to their use with positive or negative evaluations. What is most striking, however, is the sharp contrast in participants' use of medium-ranked resources used to scale their RWT *appreciation*. Medium-scaled *graduation* resources used to positively evaluate the RWT were used over twice as much as those used to negatively evaluate the RWT. The number of low- and medium-scaled *graduation* resources remains the same for learners' negative evaluation of the tool, while the number of resources in that same medium-scaled category nearly doubles in tallies of learners' positive RWT *appreciation*. What this may mean is that learners were more confident in making positive evaluations of the RWT, as demonstrated in their use of medium-scaled *graduation* for positive *appreciation*.

How participants scaled their RWT evaluations remained comparatively consistent. Learners conveyed *graduation* using similar parts of speech to scale their RWT evaluation, with most *graduation* expressed through the use of adjectives (as evidenced in Figure 3.8-3 in the Methods section). Participant 4, who used the least number of *graduation* resources, recalled "I still [low *graduation*] don't get the result I want [-*appreciation*]" after editing her text and reanalyzing with the RWT. She also remarked that "the numbers [in the word count] are kind of [low *graduation*] weird [-*appreciation*]" and that "It's [RWT feedback] kind of [low *graduation*] confusing [-*appreciation*]." Another learner who used few *graduation* resources, Participant 11, commented that "The feedback has some [low *graduation*] mistake [-*appreciation*]," but also *appreciated* a portion of the RWT positively, remarking "This [the analysis feedback after revision] is more [med. *graduation*] clear [+*appreciation*]." The majority of those resources used by Participant 9, who used the most *graduation* resources among all participants, assisted in scaling her positively charged RWT *appreciation*. For example, Participant 9 commented that "The Demonstration Module was pretty [low *graduation*] helpful [+*appreciation*]," that "The edit function was very [med. *graduation*] practical [+*appreciation*]," and that she was "writing more [med. *graduation*] carefully [+*appreciation*] with RWT." As seen in this short representation of *appreciation* by participants who used varied amounts of *graduation* resources, the type of *graduation* resource used remains rather similar. This may be a result of learners' limited linguistic resources from which to draw (if the speakers were NNSs of English and perhaps relied on repetition of the same types of resources for grading their RWT evaluation. The similarities may also be a result of the fact that these data were primarily spoken data; spoken discourse tends to be more informal and more repetitive than written discourse (Biber & Gray, 2013), thus possibly accounting for the likeness in participants' use of *graduation* resources.

What the *graduation* analysis has the ability to reveal is the rhetorical effect participants convey in their *appreciation* of the RWT. How participants sharpen or soften their statements of evaluation shows the degree of investment they place in their *appreciation* of the AWE tool and their draft revision with the tool as well as the extent they wish their authorial voice to be associated with a value position. Through the use of amplifiers or boosters, for example, statements can be sharpened or intensified (Hyland, 2000; Labov, 1984), what Martin and White (2005) call "scaling up." Softening, often occurring through the use of hedging (Lakoff, 1973), involves "scaling down" a statement, or lessening the impact or intensity of an evaluation (Martin & White, 2005).

From the results of this *graduation* analysis, it is clear that learners scaled their evaluations of the RWT's usefulness more often in positive appreciation of the AWE tool. In all the ranked *graduation* resource categories (low, medium, and high), more positive evaluation of the RWT was expressed. What is interesting, however, is the number of each scaled *graduation* resource used. Twice as many medium-ranked resources were used to positively *appreciate* the RWT as were used for negative *appreciations*. That learners were less likely to scale up or scale down their evaluations of the RWT's usefulness shows that the participants clearly felt positive about their RWT experiences —with nearly twice as many *graduation* resources used for positive as opposed to negative *appreciation*— but were not willing to commit entirely (as would have been demonstrated through the use of high-ranked *graduation* resources) to their evaluation statements of the RWT's usefulness.

The lower number of high-graded resources points to the participants' unwillingness to make absolute or conclusive statements about the RWT and their RWT experience. The use of high-ranked *graduation* resources, to amplify learners' RWT evaluations, occurred the sparingly in the data. Participants' use of high-ranked *graduation* resources served to sharpen their evaluative statements about the RWT's usefulness, *appreciation* which was relatively equal in terms of positive and negative orientation. The lack of high-grade *graduation* in both qualitative data sets reveals that participants infrequently strongly aligned themselves with their asserted *appreciation* of the RWT or their RWT experience.

Participants softened both positive and negative RWT *appreciation* equally in the open-ended survey responses and stimulated recalls, as witness in the equal number of low-ranked *graduation* resources to positively and negatively *appreciate* the RWT and their RWT experience. Softening of their *appreciation* of the RWT lessened the participants' investment in their value positions or hedged their evaluation; hedging may also serve to simultaneously assert *appreciation* while also sustaining participants' solidarity with those who could hold contradictory opinions (Martin & White, 2005). Learners' use of lower grade *graduation* resources in this study thus shows that the RWT users wished to lessen the intensity of or investment in their positive and negative evaluations of the usefulness of the RWT and their RWT experience.

Analysis of *engagement* resources used to convey appreciation in RQ1a. How learners committed to their perceptions of the usefulness of the tool through use of language of *engagement* shows participants' inclination to convey judgments of the RWT that acknowledged other potential opinions about the tool; this was conveyed through a greater use of heteroglossic resources overall, with a predominant use of *entertainment* resources for expanding participants' claims about usefulness of the RWT. In the open-ended survey responses, participants used nearly twice as many heteroglossic resources as monoglossic resources, with individual participant use varying somewhat.

Table 4.1-7

Frequency Count for Engagement Resources in Appreciation in Open-Ended Survey Responses

Participant	Monoglossic	Heteroglossic	*Engagement* Resource Total
P1	2	2	4
P2	1	4	5
P3	1	2	3
P4	3	3	6
P5	1	5	6
P6	0	5	5
P7	4	1	5
P8	0	3	3
P9	1	1	2
P10	2	0	2
P11	2	0	2
TOTAL	17	26	43

Totals for *engagement* resource usage differed slightly among participants, with participant totals ranging from 2 to 6. In other words, participants engaged in between 2 to 6 expressions of *appreciation* in the open-ended survey data. Patterns in individual learners' use of monoglossic versus heteroglossic resources were a bit more distinctive. Nearly half of the participants (P2, P3, P5, P6, and P8) used more heteroglossic than monoglossic *engagement* resources, three (P1, P4, and P9) used an equal number of both types of *engagement* resources, and three (P7, P10, and P11) used more monoglossic than heteroglossic resources.

Learners' use of monoglossia, conveyed via direct statements which fail to acknowledge perspectives different from those of the author, focused on a spectrum of *appreciation* of the usefulness of the RWT, RWT feedback, and the RWT draft revision experience, and represented a mix of both positive and negative evaluations. Participants 2, 3, 5, 9, 10, and 11 conveyed only positively charged *appreciation* of the RWT through use of monoglossia. Participant 9, for example, said "Example sentences for every individual step are [monoglossic] beneficial [+*appreciation*]" and Participant 10 remarked that "A general comparison with the other articles in my field (was) [monoglossic] (useful) [+*appreciation*]." Even the resources used by participants who only used one monoglossic resource were positively charged. Participant 2's only monoglossic resource use was projected positive and conveyed her expectation that "the use of statistics" in the Analysis Module "will be [monoglossic] great [proj. +*appreciation*]." Participant 3's single monoglossic resource likewise expressed his anticipation about future improvement of the RWT with the evaluation "interactive editing along with analysis will [monoglossic] help [proj. +*appreciation*]." Only one student, Participant 4, made solely negative evaluations of the

RWT using monoglossic resources, such as “The biggest problem [-*appreciation*] I had was [monoglossic] detection,” and “I had [monoglossic] wrong [-*appreciation*] detection.”

Those participants who conveyed more than sole positive *appreciation* conveyed a combination of negatively and positively charged evaluations of the RWT, its feedback, and the RWT experience through monoglossic *engagement.* Participant 1 noted that “(RWT) makes me [monoglossic] think to see if I haven't expressed my goal clearly [+*appreciation*],” marking a positive monoglossic *appreciation,* but later also stated a particular evaluation “was [monoglossic] a misinterpretation [-*appreciation*] of my communicative goals.” Participant 7, who also used a mix of negatively and positively charged *appreciation* resources to evaluate the RWT’s usefulness noted “It was [monoglossic] helpful [+*appreciation*] to see things broken down by moves and steps,” but also that “the disciplines lacked [monoglossic: - *appreciation*] examples to compare with.” That same participant went on to make yet another positive evaluation of the RWT through use of monoglossia, declaring “The feedback on what was done well and what needed work was [monoglossic] beneficial [+*appreciation*].”

Learners expressed much of their evaluation of the RWT’s usefulness in discursive ways that allowed the *entertaining* of other perspectives. A quantitative analysis of participants’ use of heteroglossic resources in the open-ended survey response data revealed an overwhelming use of heteroglossic resources used for expanding a claim, particularly in the *expansion* sub-category of *entertaining*. Tallies for each category of contraction and expansion of learners’ *appreciation* of the RWT’s usefulness are presented in Table 4.1-8. A description of learners’ *engagement* resources per category, and what these uses mean in answering the research question, is expounded below.

Table 4.1-8

Frequency Count for Heteroglossic Resource Categories in Appreciation in Open-Ended Survey Responses

Participant	Contract: Disclaim	Contract: Proclaim	Expand: Entertain	Expand: Attribute
P1	0	0	2	0
P2	0	0	4	0
P3	0	0	2	0
P4	1	0	2	0
P5	2	0	3	0
P6	0	0	5	0
P7	0	0	1	0
P8	0	0	3	0
P9	0	0	1	0
P10	0	0	0	0
P11	0	0	0	0
TOTAL	3	0	23	0

Learners' RWT evaluations also showed a conscious distancing of themselves from their RWT *appreciation*, as evidenced in participants' use of heteroglossica resources for *expanding* their claims about the RWT. The breakdown of participants' use of heteroglossia, employed by speakers to encode their awareness of other stakeholders in the interaction (Martin & White, 2005), clearly showed a strong tendency to use *engagement* resources for *expansion.* All participants used more resources for *expansion*, rather than *contraction* of their claims, and, more specifically, all instances of *expansion* fell into the sub-classification of *entertaining.*

Engagement resources used to *entertain* a claim, or evoke dialogistic alternatives by introducing one of a number of potential perspectives, were expressed in an assortment of ways. While acknowledgement of other perspectives through *entertaining engagement* resources can be expressed both grammatically (e.g., using modal auxiliaries like "might") or paraphrastically (e.g., using phrases like "I think"), participants in this study used phrases to present their *appreciation* of the RWT's usefulness. The phrase "I think" was among the popularly used *entertaining* phrases: "I think [*expand: entertain*] the pie chart and word count is useful [+*appreciation*]" (P4); "I think [*expand: entertain*] it would be helpful [proj. +*appreciation*] if it could indicate why it feels the way it feels a specific sentence falls in an area" (P6); "I think [*expand: entertain*] being able to change the text and then re-analyzing the text helps [+*appreciation*]." Other *entertaining* phrases used were "I felt," as in "I felt [expand: entertain] it did not do a good job [-*appreciation*] of identifying which moves I was trying at address," (P8), "I/we could," as in "We could [*expand: entertain*] use it [proj. +*appreciation*] outside of class time and more times when we are writing our drafts" (P5), and "would be," as in "It would be [*expand: entertain*] good [+*appreciation*] if the line for this feedback was divided into two columns and each column" (P2). The majority of these *expansion* resources reflected positive or projected positive evaluation of the RWT, the RWT feedback, and users' RWT experience.

Learners were less likely to communicate their evaluations of the RWT's usefulness in ways that left no room for interpretation. Of the 26 heteroglossic resources used, only three were *engagement* resources used to *contract* the scope of learners' claims. As referenced in the previous chapter, *contraction* conveys unconditional expressions that leave no question about an author's stance. While no participants used resources for *proclaiming,* or concurring with a position to rule out alternative positions, two participants engaged in RWT *appreciation* by use of resources to *disclaim,* or reject, a claim. Participant 5 used two *disclaim* resources to *contract* her assessment of the RWT, stating "RWT does not [*contract: disclaim*] analyze my sentences correctly [-*appreciation*]" and "The analysis wasn't [*contract: disclaim*] correct [-*appreciation*].” No resources were used to expand claims through *attribution,* considering other voices by explicitly referencing other sources, or contract claims through *proclamation,* expressing concurrence with a position to exclude alternative voices.

Because of the low numbers of *engagement* resource used in the open-ended survey response data, turning to the stimulated recall data may perhaps provide more telling patterns in learners’ use of the resources to *appreciate* the usefulness of the RWT. Table 4.1-9 displays the numerical tallies for students’ use of monoglossic and heteroglossic resources in their *appreciation* of the usefulness of the RWT, RWT feedback, and their RWT experience.

Table 4.1-9

Frequency Count for Engagement Resources in Appreciation in Stimulated Recalls

Participant	Monoglossic	Heteroglossic	*Engagement* Resource Total
P1	15	21	36
P2	11	33	44
P3	15	21	36
P4	10	17	27
P5	22	28	50
P6	22	36	58
P7	11	29	40
P8	21	35	56
P9	25	24	49
P10	13	21	34
P11	8	13	21
TOTAL	173	278	451

Several features of the data are immediately apparent from a first look at Table 4.1-9. Firstly, individuals’ use of *engagement* resource totals ranged between 21 and 58, indicating a large discrepancy in the number of instances of *appreciation* among study participants. Secondly, there is an overall higher usage of heteroglossic resources over monoglossic *engagement* resources, as seen in the bottom row showing totaled *engagement* resource tallies. Furthermore, unlike the open-ended survey response data findings, which revealed varied proportional usage of monoglossic and heteroglossic resources among individual participants, all participants used more heteroglossic than monoglossic resources in their *appreciation* of the RWT's usefulness in the stimulated recalls.

Those monoglossic resources used by individual participants contrasted in terms of their positively or negatively charged evaluations of the RWT's usefulness. No participants used monoglossic resources to only negatively evaluate the RWT. Some, however, did use monoglossia with primarily negatively charged resources. Participant 4, for example, used mostly negatively charged *appreciation* resources in her monoglossic *engagement* in thestimulated recalls, stating "It's [monoglossic] a crash [-*appreciation*]," "This was [monoglossic] a problem [-*appreciation*] in other disciplines," and "For me, it's [monoglossic] confusing [-*appreciation*]." Participant 6 also used a larger number of negatively as opposed to positively charged monoglossic *engagement* resources, remarking "I had [monoglossic] trouble [-*appreciation*] with it" and "Sometimes it didn't recognize [monoglossic] steps differently [-*appreciation*]." Another participant, P10, used a greater number of negative over positive *appreciation* resources in his monoglossic *engagement* claiming "I didn't read seriously [monoglossic: - *appreciation*] the RWT feedback on the right side of the Analysis Module screen" and that "Sometimes it will [monoglossic] make a mistake [-*appreciation*]."

By contrast, there were several other participants who were more positive than negative in their evaluation of the RWT's usefulness in their direct, monoglossic statements of opinion. Participant 2 only used one monoglossic resource to convey negative *appreciation,* stating "It disputes [monoglossic: - *appreciation*] what I say here." All other resources were positive and were expressed as straightforward declarations about specific useful features of the RWT, such as "Seeing examples helped me [monoglossic: +*appreciation*]." Another learner (P5) had few negative evaluative comments in her use of monoglossia, such as "It was [monoglossic] misanalyzed [-*appreciation*]," calling attention to a sentence she was referencing. Yet Participant 5 also had positive remarks about the RWT's usefulness in prompting her to rethink her writing, recalling positively "I had to think [monoglossic: +*appreciation*] about how do I put what is missing in my draft." Participant 11's monoglossic resource use also reflected more positive evaluation of the RWT through statements like "The (Demonstration Module) is [monoglossic] helpful [+*appreciation*]," and "This analysis feedback (after the revision) is [monoglossic] clear [+*appreciation*]." Also, it should be noted that one participant (P1) used monoglossia to convey only positive *appreciation* of the RWT's usefulness. Participant 1 was especially complementary of the tool in her evaluation of the Demonstration Module and its capabilities, asserting "It is [monoglossic] convenient [+*appreciation*] to see examples by clicking" and "(the Demonstration Module) is [monoglossic] great [+*appreciation*]."

Many participants conveyed a more balanced combination of positivity and negativity in their explicit judgments of the RWT's usefulness. Participant 3 made the negative evaluative claim that "The computer simply doesn't recognize [monoglossic: - *appreciation*] (certain steps)" and also a neutral claim, remarking that "the evaluation was [monoglossic] on the line [neutral *appreciation*]." Participant 7's evaluations were also mixed in terms of charge, making negative *appreciation* statements like "I decided that [monoglossic] continuing on that focus wasn't worth my time [-*appreciation*]" and also positive statements like “It was [monoglossic] great [+*appreciation*] to catch (her misunderstanding) and address something I truly did need to learn further.” Participant 8’s negative comments, like “There are [monoglossic] formatting issues [-*appreciation*]” were also countered with other monoglossic assertions which were positive, like “This part (of the analysis) was [monoglossic] right [+*appreciation*].” Yet another participant, P9, also remarked that “I skipped [monoglossic: - *appreciation*] the outline of the structure part” due to his negative evaluation of that portion of the RWT, but then made a positive claim about the RWT as a whole, stating “It gives [monoglossic] specific [+*appreciation*] feedback.”

As a whole, results from this analysis of learners’ use of monoglossic resources shows learners used this authorial voice-dominant discourse to convey primarily positive evaluations of their RWT experience. As the results of the *engagement* analysis of monoglossic resources show, six of the 11 participants conveyed only positive *appreciation* of the RWT’s usefulness through monoglossia, with the remaining participants expressing a mixture of positive and negative evaluations through monoglossia. As previously covered in Chapter 3, monoglossic texts are author-dominant and do not contain a recognition of dialogistic alternatives (Bakhtin, 1981). In terms of rhetorical positioning, speakers or writers using monoglossia accept their statements as fact or generally agreed upon knowledge (Myers, 1990). That many participants in this study used monoglossia to express positive *appreciation* of the tool or their experience with the RWT shows that study participants felt authoritative and confident in their positive evaluations of the AWE program. Remaining students’ use of monoglossia to convey a mixture of positive and negative *appreciation* reveals the same: resoluteness about a combined positive and negative evaluation of the RWT’s usefulness.

Results from a more detailed analysis of heteroglossic resource use in students' *appreciation* of the RWT in the stimulated recall data mirrored resembled RWT evaluations in the open-ended post-task survey data. Table 4.1-10 shows a summary of the frequency of heteroglossic resource use by participant as well as the total tallies for each sub-classification category.

Table 4.1-10

Frequency Count for Heteroglossic Resource Categories in Appreciation in Stimulated Recalls

Participant	Contract: Disclaim	Contract: Proclaim	Expand: Entertain	Expand: Attribute
P1	1	7	12	1
P2	1	8	23	1
P3	4	1	14	2
P4	2	3	11	1
P5	2	3	23	0
P6	12	8	16	0
P7	10	4	14	1
P8	9	7	19	0
P9	4	3	17	0
P10	4	8	9	0
P11	4	2	7	0
TOTAL	53	54	165	6

Similar to the results from the open-ended survey response data, learners conveyed much of their opinions of the RWT's usefulness by utilizing heteroglossic *entertaining* resources that *expanded* their claims and made room for dialogistic alternatives. One theme in participants' use of *entertaining* resources was expressed through their lack of agreement with the RWT Analysis module feedback. Participant 10 mentioned "I really disagree [*expand: entertain; - appreciation*] with the software" and Participant 1 also stated "I don't agree [*expand: entertain; - appreciation*] with the feedback." Another participant (P5) said she “did not agree [*expand: entertain; - appreciation*] with some of them” referring to partial agreement with the feedback provided on her section draft.

Participants softened their evaluations of the RWT’s usefulness by using *entertaining* resources such as “I find,” “I think,” or “I feel” to express an evaluation of the RWT feedback or the tool itself. Participant 3, for example, noted “I find it [*expand: entertain*] useful [+*appreciation*],” referring to the tool as a whole. Others made more specific mention of what they found helpful, such as Participant 5 who remarked, “I think [*expand: entertain*] it was helpful [+*appreciation*] for me to write a comment” and later in the recall, “I think [*expand: entertain*] the circle is giving me a bigger picture [+*appreciation*].” Participant 11 also narrowed his *appreciation* to a precise part of the RWT “I think [*expand: entertain*] provided some good [+*appreciation*] examples,” as did Participant 9, declaring “I think [*expand: entertain*] it (RWT) helps [+*appreciation*] on the analyze the writing part.” Frequently associated with the category of *affect,* the verb “feel” was also used to express *appreciation* of certain aspects of the RWT, such as Participant 8’s justification of his RWT use strategy, stating “I started down here at Move 3, because I felt that [*expand: entertain*] was the most straightforward [+*appreciation*].”

This *entertainment* resource use also took the form of speculation about what was taking place, or perhaps causing problems, during the draft revision in the Analysis Module. “I guess [*expand: entertain*] I had discrepancies [-*appreciation*] between what it thought it was and what I thought it was,” Participant 8 stated. Participant 1 hypothesized that “the problem [-*appreciation*] might be that [*expand: entertain*] some of them don’t have their own disciplines.” Participant 2 suggested it “may be [*expand: entertain*] confusing [-*appreciation*] to see there's no examples” when a learner would search through the corpus and not find her or his discipline. Uncertainty about proper functioning of the Analysis Module was expressed by Participant 8, who reported "I'm not quite sure that [*expand: entertain*] this was working right [-*appreciation*]."

Suggestions for improvement of the RWT were expressed commonly in the *entertainment* subcategory of *expansion*. Participant 4, for example, declared "I thought [*expand: entertain*] it (RWT Analysis feedback in move section) should be more clear [-*appreciation*]" and Participant 7 claimed that "I think, in general, I would have found [*expand: entertain*] it helpful [+*appreciation*]" referring to changes to be made to the Demonstration Module. Participant 2 cited that "An example that fits an area that I need to improve would [*expand: entertain*] help me [proj. +*appreciation*]" and Participant 6 noted "It would be [*expand: entertain*] really nice [proj. +*appreciation*] if they could somehow get formatting in there," referring to enhanced formatting options in the text editor portion of the Analysis Module. Participant 7 suggested "It would be [*expand: entertain*] helpful [proj.+*appreciation*] if there is a way for the computer to then reanalyze according to the feedback I gave it," while Participant 8 recommended "It would [*expand: entertain*] make sense [proj. +*appreciation*] to filter by that (move) first." Participant 5 remarked "If you can export the drafts, it might be [*expand: entertain*] better [proj. +*appreciation*]," and Participant 3 engaged in a string of suggestions for RWT improvement by use of resources for *entertaining* : "I think [*expand: entertain*] a drag-and-drop feature would be helpful [proj. +*appreciation*]; something that would be [*expand: entertain*] a little more forgiving [proj. +*appreciation*]; synchronized edits would be [*expand: entertain*] a little bit more efficient [proj. +*appreciation*]." Participant 1 suggested "Maybe a tutorial, or a demonstration would [*expand: entertain*] help [proj. +*appreciation*]," citing optimism about what materials could support future users' effective use of the RWT "…so others could also have [*expand: entertain*] a positive attitude [proj. +*appreciation*]".

Other learners were similarly optimistic about the potential future usefulness of the tool, as displayed in their use of engagement resources for positive or projected positive RWT *appreciation*. Participant 7 stated "I think [*expand: entertain*] it has great potential [+*appreciation*]" referencing the promise of helpfulness of the color-coded text produced in the Analysis Module. Participant 11 contended "I think [*expand: entertain*] the software can help [+*appreciation*]" him in his writing, and Participant 5 made the concession that, "If [*expand: entertain*] fully developed, it's helping me [+*appreciation*] (to look at my text in one way)."

As the results of the *engagement* analysis show, participants generally expressed their evaluations of the RWT's usefulness in ways that broadened the claims to consider others' opinions, using twices as many heteroglossic resources as monoglossic resources in the qualitative data. Heteroglossia is discourse which allows space for dialogistic alternatives in an assertion, or acknowledges the existence of other voices in a text (Martin, 2000). Therefore, the study participants' use of heteroglossia could represent their awareness of alternative perspectives about the RWT instead of using absolute claims that do not consider others' opinions (Martin, 2000). Perhaps fewer monoglossic than heteroglossic were used, because the learners intended to be less direct and more tentative about their evaluations of the RWT's usefulness.

It is not unusual that much of participants' *entertaining* resources expressed recommendations for improving the AWE program, because the *expansion* sub-category of *entertaining* has been observed to express individual subjectivity through postulations, certain kinds of rhetorical or expository questions, and factual propositions which serve to assert authors' opinions (Martin & White, 2005). Most of participants' expressions of *appreciation* through heteroglossia were conveyed using *expansion* and, in particular, were resources for *entertaining.* Study findings also show that the resources for *entertaining* were mainly charged as positive or projected positive and came through in participants' suggestions for how to improve the RWT. Such heteroglossic *expansion* postulations and projections have previously been observed to manifest themselves through the use of the expression "I think" (Simon-Vandenbergen, 1998) and modality (Halliday, 1994), both commonly uttered lexicogrammar in this study's data. Further, Lyons (1977) perceives modality as related to judgments of possibility, which may also elucidate why so many *entertaining* resources were used in learners' hypotheses about what may have caused problems with the RWT analyzer's detection of Moves and Steps during draft revision. Because Halliday (1985, 1994) has discerned modality as expressing lower commitment to propositions, perhaps study participants' use of modality, such as "would" or "maybe," and more subtly conveyed opinion expressions, such as "I think" or "I feel," implies the participants' less intense commitment to their asserted opinions about the RWT and their RWT experience. Still, that these evaluative expressions were principally positive is encouraging for the future of the RWT, as is shows the participants' optimism about the RWT and future growth of the RWT.

Few evaluations of the RWT's usefulness were conveyed through referencing others' experiences; the heteroglossic sub-category used by participants the least was the resource category of *attribution* in the *expansion* resource classification. In total, there were only six resources used in the stimulated recalls, and all pertained to either real-life experiences undergone by other classmates or witnessed by the participant. Participant 1 observed that "Friends in class appear [*expand: attribute*] not to be benefiting [-*appreciation*] from it" while Participant 7 noted further complications observed in her classmates' RWT interaction, stating "One of the other students had had [*expand: attribute*] trouble [-*appreciation*] with her citations." Participant 4 emulated the reaction of a fellow learner in the room, observing "Another classmate, she says [*expand: attribute*] 'Oh good!' [+*appreciation*]" when that classmate received RWT feedback which confirmed her intended rhetorical step. Finally, Participant 2 speculated about possible future users' ease of use interacting with the RWT, mentioning "Even someone with my limited skill set [*expand: attribute*] could figure it out [+*appreciation*]."

It is not entirely an unexpected finding that *attribution* was not used as frequently as *entertaining* for *expanding* learners' evaluations about the RWT's usefulness. Whereas *entertaining* involves authors' acceptance of a range of possible positions or invokes these dialogic alternatives, *attribution* calls on external voices to present their opinions (Martin, 2000). Study participants' limited use of *attribution* is not surprising considering the learners were responding to questions about perceptions of their own RWT experience and the RWT. That few *attribution* resources were used in the qualitative data suggests that the *appreciation* asserted was genuinely the participants' own evaluations of the RWT's usefulness and that they based these opinions on their own experiences and opinions and not others'.

Appreciation of the RWT's usefulness was least commonly expressed through authoritarian claims. The *engagement* sub-categories of *proclaiming* and *disclaiming* in the *contraction* category of *engagement* were used, in total each, less than a third as frequently as resources for *entertaining. Engagement* marking *proclamations* was consistently initiated by use of the conjunction "because" to justify an appraisal of the RWT system, frequently occurring in the form of sentence fragments and/or incomplete utterances (common in oral speech). Participant 7 referred to her reconciling her own knowledge and the RWT Analysis Module's recognition of a step, mentioning "because [*contract: proclaim*] I do remember that being a tricky [-*appreciation*] part." After a positively evaluation of the tool, Participant 1 justified her *appreciation* saying "Because [*contract: proclaim*] doing this while trying to write helped me [+*appreciation*]." Participant 9 also followed up a positive evaluation of the Analysis Module with the rationale of it being visually appealing, stating "Because [*contract: proclaim*] the website is colorful [+*appreciation*]," as did Participant 11, who positively *appreciated* the RWT's usefulness, with the justification "Because [*contract: proclaim*] also the software also reminded me [+*appreciation*] of the structure of the Introduction."

Learners sometimes *proclaimed* their RWT *appreciation* through outright announcements of an upcoming verbal evaluation, marked by utterances like "I say" or "I mean." "So, I'd say [*contract: proclaim*] mixed [neutral *appreciation*]," Participant 7 declared in response to a question about the RWT's current usefulness. "I want to say [*contract: proclaim*] the gap was the most problematic [-*appreciation*]," Participant 4 remarked in her negative evaluation of the RWT's ability to classify the step *Identifying the Gap.* "I would say [*contract: proclaim*] it's useful [+*appreciation*]," Participant 10 asserted. Participant 8 even recalled a moment during the stimulated recalls when he spoke, or perhaps thought, to himself in figuring whether the RWT feedback was accurate or not: "And then I said [*contract: proclaim*], okay, that first paragraph is Move 1, which is right [+*appreciation*]." "I mean" was sometimes used in place of "I say" to express proclaimed sentiments, such as "I mean, [*contract: proclaim*] the proportion (in the pie chart) is important [+*appreciation*]" (P10) or "I mean, [*contract: proclaim*] there were some sentences that I could tell it was wrong [-*appreciation*]" (P6).

Study participants' judgments of the RWT's usefulness were less commonly conveyed through rejections of standing claims about the tool. *Disclaiming* was marked by negation or negativity, and, like *proclaiming* resources, commonly occurred as incomplete utterances or clauses indirectly attached to another evaluation. "It still did not [*contract: disclaim*] recognize [-*appreciation*] it," Participant 3 noted when he had revised his sentences according to the analyzer's feedback and was still frustrated the tool did not recognize his intended rhetorical function. "But [*contract: disclaim*] it was easy [+*appreciation*] to do" Participant 6 claimed, remarking on the realization she needed to make a new draft, but had no problems accomplishing it.

Rejection of a stated or understood stance about the RWT's usefulness, by use of *disclaiming* resources, was also was commonly signaled through comparison and contrast language, many times in reference to both positive and negative aspects of the RWT or users' RWT experience. "But [*contract: disclaim*] the second half (of the sentence) is something else [-*appreciation*]," Participant 6 claimed after acknowledging the RWT analyzer's correct analysis of one part of a sentence in her draft. Participant 7 also followed up a positive *appreciation* of the RWT analyzer's ability to accurately identify an intended step with a disclaimer, noting "But [*contract: disclaim*] there were multiple instances where it would misidentify [-*appreciation*] a step." Participant 10 noted his confusion about understanding a step in the Introduction section, stating "But [*contract: disclaim*] I double-checked [+*appreciation*] the definition from the analysis," and Participant 8 evaluated his deletion of references to reevaluate the sentence “But [*contract: disclaim*] I don’t think that mattered [-*appreciation*].”

The use of *proclamations* to announce evaluative statements is common in discourse that attempts to hedge a statement or soften criticism (Martin, 2003). Study participants’ use of *proclaiming* resources such as “I mean” or “I want to say” could have been a means of circumventing their outright *appreciation,* be it positive or negative, about the RWT’s usefulness that they may have thought could be perceived as harsh or unyielding. Also participants’ use of *proclaiming* to justify their evaluation of the RWT, especially with the conjunction “because,” suggests participants’ attempts to rationalize or defend their evaluations of the RWT’s usefulness (Martin, 2003). In other words, learners’ usage of *proclaiming* resources in the data can be comprehended as a method for justifying or hedging their evaluations of the RWT’s usefulness.

Participants’ use of *disclaiming* resources for comparing and contrasting the positive and negative aspects of the RWT’s usefulness could also have been predicted, as the *contraction* category of *disclaiming* positions textual voice that is at odds with or rejects a stance (Martin, 2003). Much negative judgment about the RWT’s usefulness was expressed in participants’ *disclaiming* resources, again not surprising considering that disclaiming helps a speaker/writer deny, negate, or counter position statements. Yet patterns in the use of *disclaiming* resources are also evident, as negative *appreciation* through *disclaiming* was often preceded by positive evaluations of the RWT’s usefulness. What findings pertaining to *disclaiming* signify are learners’ sometimes contradictory opinions about the RWT in their proclamations of positivity then transition to negative *appreciation* of the RWT’s usefulness. That is to say, participants’ opinions about the RWT’s usefulness were complex, presenting both positive and negative, and sometimes opposing, *appreciation* of the RWT and their RWT experience (evidence, for example, in learners' assertions of positive *appreciation* followed by assertions of negative *appreciation* of the RWT).

An analysis of those *graduation* resources participants used to engage in their *appreciation* of the usefulness of the RWT revealed participants' preference for the use of low or medium scaled resources to grade their statements of *engagement*. It should be noted that *graduation* for *engagement* was analyzed only for heteroglossic *engagement* and not monoglossic *engagement*, as these resources have the ability to carry more nuanced subtleties and shading in conveying viewpoints, opinions, and value judgments as the author positions her or himself in the dialogic interactions (Bakhtin, 1981), and thus exhibit stronger tendencies towards scaling (Martin & Rose, 2005). Furthermore, *graduation* analyses of heteroglossic *engagement* resources are considerably more common in Appraisal research (Fryer, 2013; Herrando-Rodrigo, 2010; Perez-Llantada Auria, 2011; White, 2003).

In particular, results from a tally of participants' *graduation* resources used to engage in *appreciation* in the open-ended survey items showed approximately an equal number of low and medium scaled resources used to evaluate the RWT's usefulness. Table 4.1-11 provides a snapshot of the grade of *engagement* resource used according to the heteroglossic resource the utterance was categorized as.

Though there were few heteroglossic utterances in the open-ended survey response items, Table 4.1-11 shows a relatively equal number of low (8) and medium (10) scaled *engagement* resources used. A lower number of high graded (5) resources were used by participants. Interestingly, participants used only high graded *engagement* resources to scale their RWT usefulness *appreciation* when *disclaiming*. Patterns among the use of particular

Table 4.1-11

Graduation Resource Grade by Heteroglossic Category in Appreciation in Open Ended Survey Responses

	Contract: Disclaim	Contract: Proclaim	Expand: Entertain	Expand: Attribute	TOTAL
Low	0	0	8	0	8
Medium	0	0	10	0	10
High	3	0	2	0	5

resources for grading *engagement* were not possible to determine considering the low number of resources used in total, but will be explored in the analysis of *graduation* resources used for *engagement* in appreciation of RWT usefulness in the stimulated recall data.

An analysis of the *graduation* resources learners used to engage in evaluation of the RWT's usefulness in their stimulated recalls provided more illuminating trends with respect to with what degree of strength participants committed to their RWT *appreciation.* Table 4.1-12 displays tallies of *graduation* resource by grade (low, medium, or high) according to the *appreciation* utterance's heteroglossic resource category.

Table 4.1-12

Graduation Resource Grade by Heteroglossic Category in Appreciation in Stimulated Recalls

	Contract: Disclaim	Contract: Proclaim	Expand: Entertain	Expand: Attribute	TOTAL
Low	7	7	68	4	86
Medium	13	27	65	1	106
High	33	20	32	1	86

What is apparent from the table is that participants conveyed their evaluations of the RWT's usefulness by using more medium-graded *engagement* resources than low or high graded *engagement* resources. Medium scaled resources made up 38% of the total *graduation* resources used for participants' *engagement* in *appreciation* of the RWT's usefulness, while low-scaled and high-scaled resources each accounted for 31% of the total. While there are similarities in the overall numbers of low- and high-scaled *graduation* resources of *engagement,* there are marked differences in the heteroglossic categories to which these utterances are labeled. In terms of *contraction*, learners used a low number of low-scaled *graduation* resources (7 in each category) for *disclaiming* and *proclaiming*. When *disclaiming*, more resources were graded as high *graduation* (62%, or 33 of 53 total)*,* and in the category of *proclaiming,* more resources were scaled as medium *graduation* (50%, or 27 of 54 total). A relatively equal number of low- (41%) and medium-scaled (40%) resources in the *expansion* category of *entertaining* were used*,* while a much lower percentage of high-scaled resources (19%) in the same category were used. Overall, few resources for *attribution* were used to evaluate the RWT's usefulness, with each scaled category containing similar frequency counts.

To gain a more well-defined sense of exactly how resources were graded, it may be helpful to observe what lexicogrammar learners used in *engaging* in their *appreciation* of the RWT's usefulness. Tentative assertions were conveyed through low-scaled *graduation* using lexicogrammar such as "appears like/to" such as "friends in class appear not to [low *expand: attribute*] benefit from it [-*appreciation*]" (P1), and "seems like," as in "It seems like [low *expand: entertain*] everything's good [+*appreciation*]" (P4). "Appear to" and "seems like" are both phrases indicating hesitance on the part of the interlocutor in consigning her or his assertion. Speculative thinking verbs such as "guess" and "wonder" were also used to scale down a speaker's commitment to their *appreciation* of the RWT. In response to a question about the features she found useful, Participant 6 responded, "So I guess [low *expand: entertain*] the convenience [+*appreciation*] of the technology." At the very start of Participant 8's stimulated recall, he remarked "So I guess [low *expand: entertain*] the first thing that caught my eye [+*appreciation*] was the colors, the colors, how the colors corresponded to what I thought Move 1, 2, and 3 were."

Auxiliary verbs, such as "may," "might," "could," and "would," were the most commonly used among the low-scaled *graduation* resources. "Sometimes it may be [low *expand: entertain*] boring [-*appreciation*]," Participant 9 commented, as she explained some of the negative features about the tool. Participant 1 reasoned why some people may have been struggling with the RWT, remarking "It might be that [low *expand: entertain*] the problem [-*appreciation*] is that some of them don't have their own disciplines." "Could" was frequently used with projected positive *appreciation* of the RWT. Referring to how change in verb tense may make a large difference in the RWT analyzer's recognition of a certain step, Participant 3 hoped that *"*It could be [low *expand: entertain*] fine-tuned [proj. +*appreciation*]. "Would" was another auxiliary verb used recurrently to convey participants' projection about potential positive aspects of the RWT. Participant 4 stated that "Trying to figure out the problems would [low *expand: entertain*] help me [proj. +*appreciation*]" in discussing how the RWT could help her to determine problematic aspects in her argument development. Participant 5 also foresaw the potential usefulness of the RWT, mentioning "It would be [low *expand: entertain*] helpful [proj. +*appreciation*] if the RWT tool had some kind of a function that would allow you to export the feedback into like a Word document."

One means by which learners scaled their *engagement* in *appreciation* of the RWT's usefulness in a medial way was through participants' use of verbs expressing desire, such as "wish," "hope," or "want." Participant 5 remarked, "I wish [medium *contract: proclaim*] it can be modified for us [proj. +*appreciation*] to notify the right grammar." In justifying his suggestion for the pie charts to be more apparent on the original RWT Analysis Module screen, Participant 10 reasoned "Because I want to see [medium *contract: proclaim*] the proportion [proj. +*appreciation*]." Verbs conveying participants' expressions (said verbal or intended message), such as "say" and "mean," were also medium-scaled *graduation* resources commonly used. Participant 4 stated "I want to say [medium *contract: proclaim*] the gap is most problematic [-*appreciation*]," while Participant 6 state "I mean [medium *contract: proclaim*] there were some sentences that I could tell it was wrong [-*appreciation*]."

Notice how in the examples provided thus far, all *engagement* resources were *contracting proclaiming* heteroglossic resources, a trend that appeared in the analysis of these verbs of desire and expression or proclamation. Finally, conveying opinion through use of the perceiving or thinking verbs "find" and "think" recurred often in the analysis of stimulated recall data. In discussing her perception of the RWT, Participant 3 remarked, "Oh, I find it [medium *expand: entertain*] very useful [+*appreciation*]." Almost all participants (except for P6) used the verb "think" in conveying RWT *appreciation* along a medium *graduation* scale. Evaluations using "think" were both positive and negative, but generally incorporated the heteroglossic resource of *expanding* through *entertaining.* Participants were quoted as saying: "I think [medium *expand: entertain*] it would be helpful [+*appreciation*]" (P5); "I think [medium *expand: entertain*] it makes sense [+*appreciation*]" (P8), referring to looking at the move or the steps first and then finding how papers in the Demonstration Module emulate the structure; "I think [medium *expand: entertain*] it has great potential [proj. +*appreciation*]" (P7); and "I think [medium *expand: entertain*] it's kind of easy to use [+*appreciation*]" (P2).

Learners' confidently expressed their *appreciation* of the RWT's usefulness by using verbs and phrases representing high-level *engagement*. The modal verb "should" was quite commonly used by the learners to *engage* in their RWT evaluation. Participant 9 asserted "We should [high *expand: entertain*] have [proj. +*appreciation*] our own discipline (in the corpus) and more examples in our field," and Participant 4 believed "The example module should [high *expand: entertain*] be more clear [proj. +*appreciation*]." Certainty about their engagement in evaluating the RWT was also expressed through language indicative of knowing or accepting the opinion as fact. Participant 7, for example, remarked "But the fact that [high *contract: disclaim*] there wasn't much of anything in my field was bad [-*appreciation*]." Responses to interviewer questions which were variations of Yes or No also represented strength in the participants' *engagement* with their RWT evaluation. In responding to a question as to whether she found an issue [-*appreciation*] with the RWT analyzer, Participant 6 responded "Yeah, [high *expand: entertain*]" before going on to list and describe the problematic aspects of the analyzer. Participant 11 also gave an affirmative answer "Yeah [high *expand: entertain*]" when asked if he had given up [-*appreciation*] after he tried to change the text to receive different results from the analyzer, and Participant 3 responded "Yup [high *expand: entertain*]" when asked if the subject being deleted from the sentence detracted [– *appreciation*] from the sentence's function.

As the *graduation* analysis reveals, study participants committed with confidence, but not extremeness to their evaluations of the RWT's usefulness, as witnessed in their preferences for using medium-scaled resources to grade their statements of *engagement* when *appreciating* the RWT. The advantage of scaling engagement through medium-graded lexicogrammar is that these resources have the ability to carry more nuanced subtleties and shading in conveying participants' opinions about the RWT's usefulness (Bakhtin, 1981). RWT users' use of medium-scaled *graduation* was frequently used to express learners' desire (using verbs like "wish," "hope," and "want") with regards to wanting additional RWT features or capabilities. This use of medium-scaled *graduation* represents learners' strong desire for the RWT to be improved, a positive finding as it could be construed to represent learners' anticipation for using a more developed version of the RWT in future research article draft revisions.

The low-scaled *graduation* resources, commonly expressed through use of auxiliary verbs such as "appear to," "might," or "seem," served to convey participants' tentativeness about their asserted *appreciation* of the RWT's usefulness. Again, much positive *appreciation* was asserted through low-scaled *graduation* as participants made recommendations for improvements to the RWT or hypothesized about how the tool could be used more efficiently. The use of low-scaled *graduation engagement* verbs like "guess" and "wonder" and modality, also acknowledged to be linked to judgments of possibility (Lyons, 1977) helped learners' speculate about future potential uses of the RWT as they *entertained* the possibilities through projected positive *appreciation* of the tool's usefulness.

Interestingly, high-scaled *graduation* resources were used only to scale up participants' *disclaiming* resources. Halliday (1994) maintains that use of high modality conveys an author's intensified commitment to position statements. Hyland (2000) also recognizes that intensifiers or amplifiers, like those used to scale up learners' *disclaiming* resources, signal a speaker's/writer's enhanced certainty or confidence with regard to an assertion. Study participants' use of high-scaled *graduation* resources, commonly communicated through the modal "should," could be perceived as conveying learners' confident commitment to their recommendations for changes to the RWT; learners' intense dedication to improving the RWT may further evoke their willingness to use an improved version of the tool in the future, or have the RWT improved for other novice research writers.

To summarize findings from the *appreciation* analysis of open-ended survey responses and stimulated recalls, the study found that participants conveyed more positive *appreciation* of the RWT's usefulness than negative or neutral evaluations. The positivity came in the form of both outright positive remarks about the RWT in its current state as well as hopeful statements about the projected future use of the tool. Most negative and projected negative evaluations centered on the inaccurate RWT feedback students received from the RWT analyzer and the lack of representation of all disciplines in the RWT corpus. The learners commonly committed to their *appreciation* of the RWT's usefulness through a medium level of engagement, and primarily in the classification of *entertaining* to *expand* a claim through heteroglossia. Participants were also optimistic about the improvement of the RWT and RWT feedback accuracy, and eager to suggest specific ways it could be improved in terms of functioning and application or feature integration. The next section will explore the *affect* learners conveyed in their *appreciation* of the usefulness of the RWT.

Affect analysis for RQ1a. Though the initial plan for data analyses in answering RQ1a did not include the analysis of *affect* resources, it was determined early in the *appreciation* analysis that an *affect* analysis would provide insightful feedback on participants' perceptions of the usefulness of the RWT. An *affect* analysis of the open-ended survey responses and stimulated recall data overall showed mixed results in terms of positive or negatively charged emotional responses to the RWT in evaluations of the tool's usefulness, with participants expressing more positive emotions in the open-ended survey response data and more negative emotional reactions in the stimulated recall data. Table 4.1-13 displays the results of a frequency tally of all *affect* resources used by individual participants in the open-ended survey responses.

Table 4.1-13

Frequency Count for Affect Resources in Open-Ended Survey Responses

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Affect* Resource Total
P1	1	3	1	0	0	5
P2	2	0	0	0	0	2
P3	0	0	0	0	0	0
P4	0	0	1	0	0	1
P5	1	0	0	0	0	1
P6	1	0	0	0	0	1
P7	1	0	0	0	0	1
P8	0	0	0	0	0	0
P9	1	0	0	0	0	1
P10	0	0	0	0	0	0
P11	0	0	0	0	0	0
TOTAL	7	3	2	0	0	12

Though few *affect* resources were used in participants' responses on the open-ended survey items, what can be observed in this table is the larger number of positively charged *affect* resources. Together, positive and projected positive resources accounted for 10 of the 12 (83%) total *affect* resources used by participants. Only two resources were negatively charged.

The actual *affect* resources used by participants converged on learners' liking the RWT and RWT feedback. Participants 1, 2, 5, 6, and 7 all "liked" or "like" some aspect of the RWT. Participant 2, for example, liked "the color coded and the statistical summary, also the examples" while Participant 5 like "the analyzed sentences." Participant 6 expressed she liked that "it tells me what it thinks I'm doing," while Participant 7 liked that "the RWT analyzed in context of discipline." Other positive *affect* resources were feelings or states learners felt which showed optimism about the tool. Participant 9 commented that "The comparison charts comparing my writing and what the writing should be makes me motivated [+*appreciation*]." Participant 1 was more "curious [+*appreciation*] what caused the misinterpretation of my communicative goal." Curiosity was interpreted as a positive emotional response in this case, as it conveyed a sense that the learner wanted to know more about the functioning of the RWT and the analyzer tool, and was thus more engaged in the process and interactivity with the tool.

Only two negative *affect* resources were used in the survey responses; one pertained to a student's discomfort in some aspect of using the tool, while the other was an expression of disinterest in an analysis feature. After Participant 4 negatively *appreciated* the RWT analyzer's "wrong detection" of moves and steps, she added that this "actually made me feel uncomfortable [-*affect*]." In discussing interest in certain elements of the tool, Participant 1 said she was "less interested [-*affect*] in the percentage feedback" over other more preferred qualities of the tool.

That participants used *affect* to express more positive emotions concerning the RWT's usefulness is an encouraging finding of this analysis of open-ended post-task survey responses. Positive *affect* was conveyed primarily through learners' statements converging on liking particular features or functions of the RWT, optimism about the projected, improved state of the RWT, and curiosity about the tool and how it works. Stated positive *affect* is also promising for the RWT, because multiple studies (Cotos, 2011; Grimes &

Warschauer, 2010; Schroeder, Grohe & Pogue, 2008) have cited positive attitudes as relating to increased learner motivation.

Participants also articulated some negative *affect* in this set of the qualitative data. The negative *affect* expressed in the open-ended responses was conveyed in expressions of disinterest in parts of the RWT or discomfort learners felt using a particular feature of the tool. Perhaps the lack of interest about certain RWT features or feelings of discomfort using the tool spurred the large number of suggestions learners' made for improving the tool.

Results from an analysis of *affect* resources used in the stimulated recalls, however, painted a slightly different picture of learners' emotional responses to the RWT in discussing its usefulness. Table 4.1-14 shows a breakdown of the number of *affect* resources used by each participant in the stimulated recalls.

Table 4.1-14

Frequency Count for Affect Resources in Stimulated Recalls

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Affect* Resource Total
P1	5	3	4	0	0	12
P2	3	0	0	0	0	3
P3	0	0	8	0	0	8
P4	0	0	6	0	0	6
P5	0	0	2	0	0	2
P6	7	1	2	0	0	10
P7	1	0	4	0	0	5
P8	3	0	3	0	0	6
P9	3	0	2	0	0	5
P10	0	0	1	0	0	1
P11	0	0	1	0	0	1
TOTAL	22	4	33	0	0	59

As seen in the table, the number of positive and negative *affect* resources vary from the counts in the open-ended survey responses. Participants used only 59 resources used total, 26 (44%) of which were positive and projected positive, and 33 (56%) of which were negative. No neutral or projected negative *affect* resources were used in the stimulated recalls. Also clear from the table are variations in the number of *affect* resources used among participants. Participants 1 and 6 used ten or more resources, while there were some participants (P10 and P11) who used only one.

A qualitative analysis of the *affect* resources reflected similar usage of the type of *affect* resources. A number of participants expressed curiosity about elements of the RWT. After attempting to figure out why the RWT analyzer was providing inaccurate feedback, Participant 1 said it "Makes me curious [+*affect*] to see if it is the only reason why the system identifies it as a function." After changing her text in light of the feedback she received on her draft, Participant 7 remarked she "was curious [+*affect*] to see if that (Move 3) showed up." Starting out her stimulated recall, Participant 2 noted that "First I was kind of curious [+*affect*] what it (RWT) would do." Participant 6 mentioned a number of times she was curious [+*affect*] about "about establishing the territory," "what synthetic (chemistry analysis using RWT) would look like," "how the tutor views some of those sentences that are so fragmented when it's missing key things," and if the RWT "would see something different after changing the disciplines." Participant 8 was also curious [+*affect*] about several parts of his RWT experience, including "about how the system had analyzed this versus what I had intended" and about "differences between biophysics and biochemistry corpora comparisons."

Another recurrent means of expressing positive *affect* towards the RWT's usefulness appeared in the use of verbs "like" and "love." "I like [+*affect*] the use of visual images," Participant 2 articulated, while Participant 8 communicated "I liked [+*affect*] those pie charts." In responding to a question of what she thought of the analysis with the RWT, Participant 6 commented "I actually liked [+*affect*] it," almost giving the sense she expected to dislike the Analysis Module. In thinking of how the RWT could be improved, Participant 1 stated "I would like [proj. +*affect*] some maybe linguistic features about why the system identifies a sentence as one." This same participant later maintained she "would love [proj. +*affect*] it to save my article with a name."

Negative emotional reactions to the RWT and learners' RWT experience were represented through variations of the adjective "surprised." While surprise could potentially be interpreted as positive *affect,* a closer examination of the context of the resource and the tone of voice with which the participant spoke confirmed each use of "surprise" to transmit a more negativity than positivity. Participant 9 disclosed she "was surprised [-*affect*] there is no red part on my reading essay, writing essay," when reviewing the feedback provided by the RWT, the "red part" conveying the presence of Move 2 in her draft. Participant 3 also verbalized it was "a surprise [-*affect*] the software said that I had no significant contribution." A variation of "surprise," Participant 3 also noted he was "flattened [-*affect*] by the fact that the niche identification was so low." Participant 8 declared "It was surprising [-*affect*] that it (RWT analyzer) thought Move 2 was the largest in terms of what I tried to address, so I thought that that would be the most significant." Later in the recall this participant also remembered he was "shocked [-*affect]* when I saw Move 1 up there with like almost 80%." Only one instance of "surprise" was used in a positive way when Participant 6 told the interviewer she was "surprised [+*affect*] with how much I liked this tutor."

Negative *affect* came across through the use of lexicogrammar conveying confusion or puzzlement as well. When discussing his emotions upon immediately receiving feedback on his draft, Participant 10 stated “I was a little bit confused [-*affect*] at the very beginning.” Participant 1 worried that when using the RWT “you can confuse [-*affect*] a lot of steps,” because the Analysis Module was not as clear as she had expected. Participant 7 was concerned that while using the RWT “there’s the potential for actually creating confusion [-*affect*].” Participant 7 later told the interviewer she was “puzzled [-*affect*], because I didn’t know how to be more explicit (with general information step).” Participant 4 used the most number of confusion-oriented language, stating “I feel confused [-*affect*] that it says I don’t have enough previous review,” at a certain point in the draft analysis she felt “confused [-*affect*] by the general information (step),” and that she was “confused [-*affect*] where I should put the literature.”

The most common expression of negative *affect* communicated learners’ frustration experienced when using the RWT. Participant 9 described “Sometimes I felt frustrated [-*affect*] because I try to make the perfect sentence, and try, try, try, it doesn’t work.” Participant 1 also experienced frustration when explaining her experience with draft revision, describing it as “kind of frustrating [-*affect*].” Participant 3 was likely the most frustrated with the RWT, exclaiming “it was frustrating [-affect]” that “the software was giving me an example that is appropriate for that move, but then not analyzing it as such,” that “it’s picking out specific words (and not recognizing new step based on syntax),” and that it was “frustrating [-affect] when the module would not pick up on the fact that I had copied that exact language or would recognize it as the same move.” The only *affect* resource expressed by Participant 11 was a negative one; he voiced “I was frustrated [-*affect*] the software can’t identify what I mean if you just state your research.”

Integrating the analysis results from the stimulated recalls with the open-ended survey responses together, the analyses of *affect* revealed more negative *affect* conveyed by participants. Several negative *affect* resources conveyed learners' feelings of surprise that was frequently associated with the RWT's inability to accurately identify certain rhetorical functions. The reports of surprise indicate that the participants had previous expectations for what they thought they may encounter in their RWT experience or in the feedback (Martin & White, 2005); surprise, in this regard, was considered a negative emotion, because the expressions communicated a failure of the RWT to meet learners' expectations in their draft revisions.

Frustration, another negative emotion cited by participants, related mainly to the system not generating new feedback after the learner had made revisions to their draft. The results, however, revealed that the frustration provoked some learners to explore the Demonstration Module, extract example sentences using the concordancer and using the RWT analyzer, check whether the actual rhetorical function could be accurately identified by the RWT. While unchanging RWT analyzer feedback may have prompted some frustration, the process learners engaged in to check their understanding of the rhetorical functions of Introduction sections supports notions of the interactionist approach, a model which forms a part of the foundation for the RWT; according to interactionist tenets, participants were observed to be interacting with the AWE tool to test their assumptions about generic writing and make modifications to their TL output (Long, 1996). In other words, the process by which learners tested their understanding of genre conventions by entering into the analyzer data they were certain fulfilled a particular rhetorical function shows provisions for their language learning as the learners work to recognize positive and negative evidence from authentic examples of published research writing and their own drafts.

Additionally, the frustration that may have motivated learners' exploration of the RWT corpus examples could be seen as constructive in helping participants access and apply the knowledge of the genre conventions on their own; New Rhetoric proponents would deem this a positive finding, since they promote language development through implicit measures (i.e., involvement in a discourse community) as opposed to explicit genre instruction (Bazerman, 1988; Coe, 2002; Freedman & Medway, 1994). Functional linguists would likely also contend that participants' control over the timing, content, and means of their own learning leads to effective development of strategies for analyzing and applying genre knowledge (Derewianka, 1999; Martin, 1985). Study participants' self-exploration of authentic samples of discourse in published texts in their fields alleviates what Martin (1985) calls "high interventionist" pedagogy wherein the instructor manages the learning process. The results may therefore show that the RWT helps to facilitate an experience by which the novice writers, RWT users, grow strategies for critically analyzing texts on their own, thereby placing the learning back in the hands of the learner.

The positive *affect* expressed in both data sets often came across through learners' expressions of curiosity about functioning or capabilities of the RWT. Positive *affect* was conveyed through learners' reports of "liking" or "loving" certain aspects of the RWT, or wishing possible improvements could be made to the AWE tool. One feature especially liked by participants was the fact that the RWT analyzed student writing within the context of the discipline. Learners' preference to have their texts analyzed within their disciplines would again be considered positive by New Rhetoric scholars in that it may imply the participants are conscious of their own texts as fulfilling social roles in rhetorical, social contexts (Bazerman,1994; Devitt, 1993; Freedman & Medway, 1994; Miller, 1994).

Finally, what is important to take away from this *affect* analysis is that learners did indeed experience emotional reactions when asked about their draft revision with the RWT. It is clear there was variation in the participant group's expressions of *affect*, with some participants using numerous *affect* resources and some expressing no *affect* whatsoever in discussions of the RWT's usefulness. This variation exemplifies the differing levels of emotional investment participants felt or expressed with regards to their RWT evaluations, or perhaps to the RWT experience as a whole. Yet participants' communication of *affect* when asked about the RWT's usefulness signifies that learners indeed felt emotions during their draft revisions with the AWE tool. Writing and revising the drafts with the RWT not only required an investment of time and energy on the writers' part, but also apparently an investment of the writers themselves as they engaged in research writing as a cultural practice (Hanna & de Nooy, 2003).

To summarize results of the *affect* analysis, learners expressed both positive and negative emotional responses in their discussion of the usefulness of the RWT. Negative responses were more prevalent in the stimulated recall data, where learners conveyed emotions of confusion, surprise, and frustration with their RWT experience. Positive *affect* resources were used more frequently in the open-ended survey responses, and were expressed using adjectives of curiosity and descriptions of what the participants liked or loved about their experience with or certain features of the RWT.

Triangulation of Quantitative and Qualitative Results for RQ1a

Results of the triangulation of quantitative and qualitative data revealed similarities in how each individual participant and the class as a whole perceived usefulness of the RWT. Expressly, the data triangulation revealed overall positive perceptions of the RWT's usefulness, with some concerns about ease of use, particularly in terms of functioning of the RWT analyzer.

Combining the *appreciation* resources participants used in both the open-ended post-task survey responses and the stimulated recalls, we are able to gain a better understanding of how positively or negatively each participant evaluated the usefulness of the RWT. Table 4.1-15 displays a breakdown of each participant's positive and negative *appreciation* conveyed in the open-ended post-task survey responses and the stimulated recalls. (Positive and projected positive resources and negative and projected negative resources were consolidated for this data display. Neutral resources were excluded due to their small amount of occurrence).

Table 4.1-15

Comparison of Appreciation Resource Use in Qualitative Data

Participant	Survey (+)	Recalls (+)	Total (+)	Survey (-)	Recalls (-)	Total (-)
P1	2	30	32	2	6	8
P2	5	30	35	0	14	14
P3	3	23	26	0	11	11
P4	1	12	13	5	15	20
P5	4	37	41	2	13	15
P6	5	29	34	0	29	29
P7	3	11	14	2	28	30
P8	2	35	37	0	20	20
P9	2	34	36	0	15	15
P10	2	16	18	0	18	18
P11	2	12	14	0	9	9
TOTAL	31	269	300	11	178	189

As can be witnessed in an examination of the table, tallies for positively charged *appreciation* resources (in open-ended survey response items, stimulated recalls, *and* sums of both) exceeded tallies for negatively charged *appreciation.* Whereas positive resources from the open-ended survey responses and stimulated recalls totaled 300 resources, negatively charged resources totaled 189. Figure 4.1-1 gives a visual of the percentages of each charge of *appreciation* resources for evaluating the RWT's usefulness. Positively charged *appreciation* represents 61% of all *appreciation* expressed, whereas negatively charged *appreciation* represents 39% of overall *appreciation.*

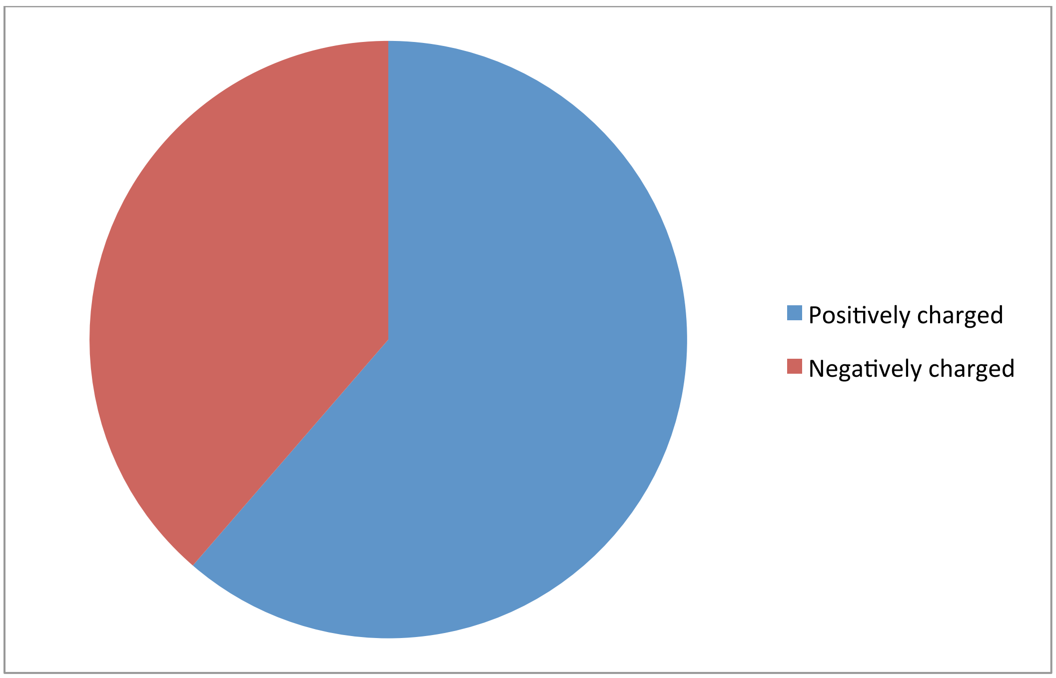


Figure 4.1-1. Distribution of *appreciation* resource charges in open-ended survey responses and stimulated recalls

Results from comparison of the positive and negative *appreciation* in the open-ended survey responses and stimulated recalls, thus confirm that participants expressed more positive *appreciation* of the RWT and their RWT draft revision experience in terms of usefulness. This, however, shows us only the picture for group totals. An analysis of the learners may help reveal discrepancies in individuals' personal usage of positive or negative *appreciation* resources.

The visual display shown in Figure 4.1-2 more clearly illustrates the trend in participants' use of *appreciation* resources in terms of their charges.

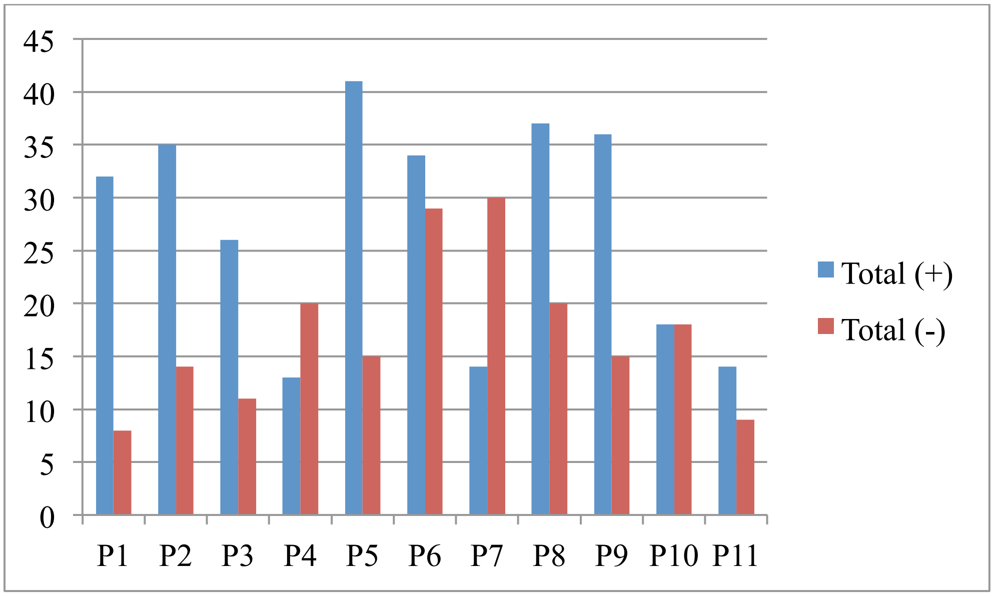


Figure 4.1-2. Total of positive and negative *appreciation* resources used by participant (p=participant) in open-ended surveys and stimulated recalls

In closely examining Figure 4.1-2, a pattern emerges. Aside from three participants, there is a trend among individuals to express more positive than negative evaluation of the RWT and their RWT experience. Many participants (P1, P2, P3, P5, P8, and P9) expressed strikingly more positive than negative *appreciation* of the RWT. Differences in other participants' (P6 and P11) *appreciation* of the RWT were less marked, though positive *appreciation* still outweighed negative *appreciation.* One participant (P10) conveyed an equal amount of positive and negative *appreciation* of his RWT experience and the RWT tool. Two participants (P4 and P7) expressed more negative than positive *appreciation,* with Participant 7 expressing far more negative than positive evaluation of the RWT.

Comparing the *appreciation* tallies to the Likert-scale post-task survey responses we see similar trends, with both overall group and individual participant responses tending towards positive reactions to and evaluations of the usefulness of the RWT. As covered earlier in this chapter, the descriptive statistics describing learners' perceived usefulness of the RWT in Likert-scale survey responses all resulted in median values of "3" and Mean values of no less than "3" (on a scale from 1 to 4 with "4" indicating the strongest agreement) indicating agreement with the statements concerning the ease of understanding the RWT feedback, the feedback prompting a return to writing as well as a review of the author's rhetorical intention, willingness to change writing based on the RWT, and optimism about potential usefulness of the tool for graduate students. Considering participants' agreement with usefulness-oriented statements in the Likert-scale survey response items and generally positive *appreciation* of the RWT in the systemic functional analysis of learners' open-ended survey responses and stimulated recalls, it is thus clear from this triangulation of group data that learners found the RWT to be useful and were positive in their evaluation of the tool and their draft revision with the tool.

Table 4.1-16

Participant Responses to Likert-Scale Post-Task Survey Questions about RWT Usefulness

Likert-Scale Survey Response Item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
I found the RWT easy to use.	3	4	3	3	4	3	2	3	3	4	3
I understood the feedback.	3	3	3	3	3	3	3	3	3	3	3
The feedback made me think twice about my writing.	4	3	3	4	4	3	3	3	3	4	3
The RWT tool is useful for improving research article writing skills.	3	3	3	3	4	3	3	3	3	4	3
I would like to use the Research Writing Tutor again.	4	3	4	3	4	3	3	3	3	4	3
The RWT tool helped me develop skills for writing research articles.	3	3	3	3	4	3	3	3	3	3	3

Individual participant responses on the Likert-scale survey items are shown in Table 4.1-16. While it is clear numerical values of 3 and 4 are common in the table, it may be difficult to discern each learner's tendency to strongly agree or simply agree with the statements about the usefulness of the RWT. Figure 4.1-3 shows a more clarifying visual depicting participants' agreement with statements on the Likert-scale items in the post-task survey. All items pertain to learners' perceptions of the usefulness of the RWT. Along the y axis are the Likert-scale rankings from 1 to 4 ("1" signaling strong disagreement with the statement and "4" signaling learners' strong agreement with the statement.)

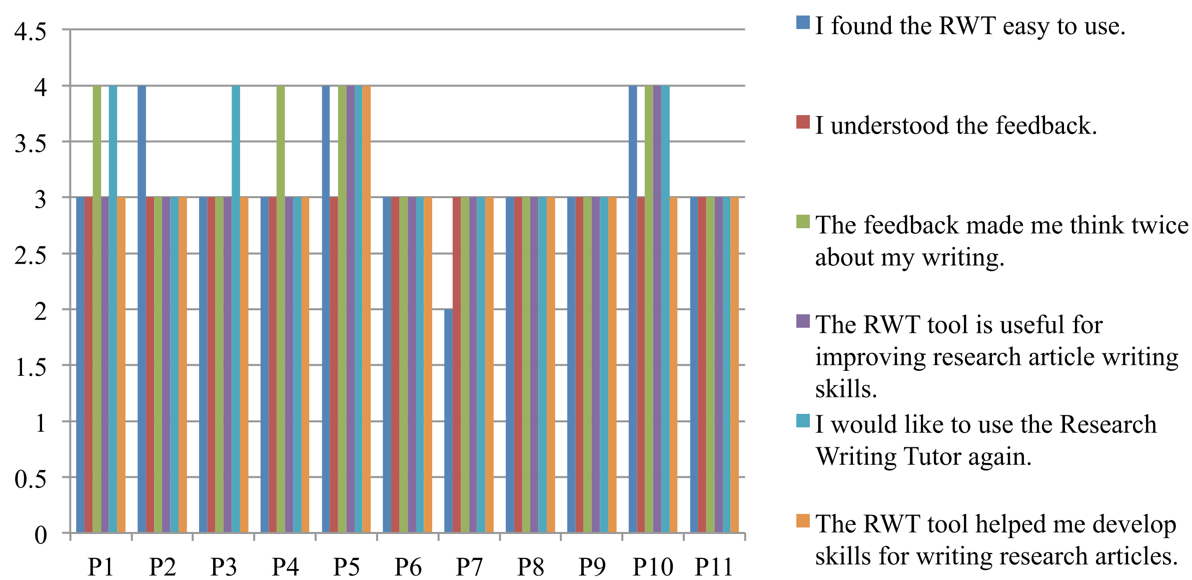


Figure 4.1-3. Participants' responses to Likert-scale items on post-task survey about RWT usefulness *Note:* X axis shows participant indicators; Y axis shows points 1-4 on the 4-point Likert-scale survey where 1=strong disagreement, 4=strong agreement.

Figure 4.1-3 shows clearly that some participants (P5 and P10) indicated much strong agreement with statements on the RWT's usefulness, while other indicated some (P1, P2, P3, and P4) strong agreement with the statements. Others (P6, P7, P8, P9, and P11), by contrast, did not strongly agree with any statement about the RWT's usefulness, and one participant (P7) showed disagreement with one statement about finding the RWT easy to use.

Comparing the Likert-scale survey responses to the *appreciation* resource analysis may help illuminate patterns in how individual participants tended to positively or negatively evaluate the RWT's usefulness. Figure 4.1-4 below provides an immediate comparison of the positive and negative *appreciation* resource tally in the qualitative data (in the top graph) and

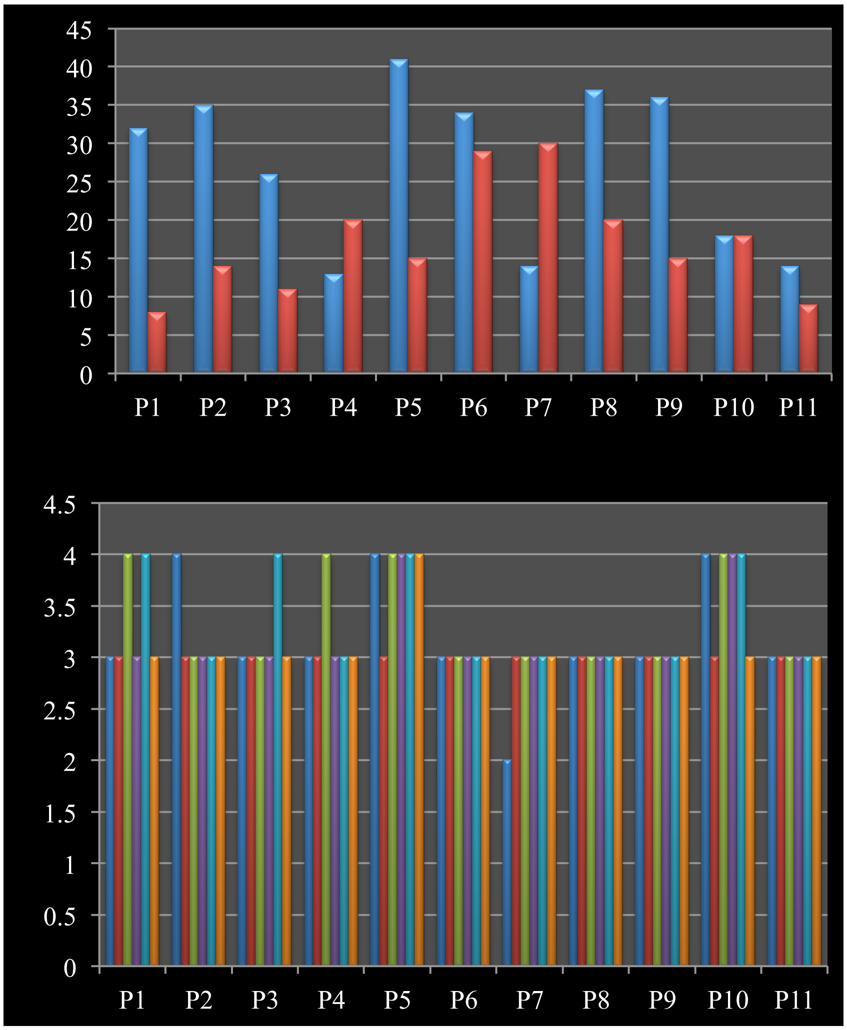


Figure 4.1-4. A within-participant comparison of positive (in blue) and negative (in red) *appreciation* resource use (in top chart) compared to agreement with Likert-scale statements (in bottom chart) about RWT usefulness

agreement about RWT usefulness in participants' Likert-scale responses on the post-task survey (in the bottom graph). In both graphs, the X axis represents the participant identifier.

The juxtaposed graphs provide the opportunity to conduct a within-participant comparison of learners' responses to the RWT across a variety of data. A comparison reveals that some participants tended to remain more positive throughout their evaluation of the RWT and their RWT experience. Participant 5, for example, was overwhelmingly positive in her use of *appreciation* resource and also strongly agreed with statements about the RWT's ease of use, willingness to use the tool again, and perceptions of the tool's usefulness for her and other graduate students. Likewise, Participant 7 was more negative than positive in her *appreciation* of the RWT's usefulness in the stimulated recall and open-ended survey data, and similarly critical in the Likert-scale data, disagreeing with the statement about the RWT's ease of use. Participant 1, perhaps the most positive in her *appreciation* of the RWT's usefulness in the qualitative data, strongly agreed with Likert-scale statements regarding the RWT making her question her rhetorical intentions and that she would want to use the tool again. While Participant 10 strongly agreed with Likert-scale statements on the usefulness of the RWT, he remained balanced in his positive and negative *appreciation* of the RWT in the qualitative data. Other participants were similarly hesitant to "strongly agree" with the Likert-scale survey items, though their *appreciation* of the tool may have been overly positive (P8 and P9) or slightly negative (P4).

Learners' positive perceptions of the RWT are reflected in trends in the qualitative SFL analyses of participants' *appreciation* resources and mirrored in findings from the learners' Likert-scale survey responses. For example, in response to the Likert-scale response statement "I found the RWT easy to use," Participants 5 and 10 strongly agreed. In the stimulated recalls, Participant 5 was noted as saying "I think the circle (pie chart) is giving me a bigger picture" and Participant 10 also remarked "The comparison makes sense to me;" interestingly, with both participants referencing the pie chart comparison of the move distribution in their own Introduction section and published Introduction sections in their fields. Participant 7, however, was the only learner who disagreed (marking "2" on the Likert-scale response item) that the RWT was easy to use. In her stimulated recalls, this participant made a number of negative evaluations of the RWT in terms of the lack of examples in her field, and also remarked that trying to reconcile her own understanding with the RWT's understanding of a move or step was "a tricky part."

In their evaluations of the RWT's usefulness, comprehension of the feedback rang through as a prominent theme. Corresponding to the Likert-scale item statement "I understood the feedback," no participants strongly agreed with the statement, neither did they disagree or strongly disagreed. A return to the *affect* analysis may shed light on why no participant strongly agreed they understood the feedback. Recall that a number of participants found the feedback "confusing" in some way, with Participant 1 remarked "You can confuse a lot of steps," when looking at the feedback, or Participant 7 noting "There's the potential for (the RWT) actually creating confusion." Yet everyone agreed with this statement that the feedback was understandable, with comments like "The analysis feedback was clear" (P11).

The RWT evaluations also revealed learners' willingness to change their drafts in consideration of the RWT's feedback. In response to the Likert-scale item "I will change my writing based on the RWT feedback," a number of learners (P1, P4, P5, and P10) strongly agreed. Participant 5 commented that the tool "gives me an initial point of thinking," and even compared the RWT feedback to human feedback, noting the RWT feedback "reminded me of a comment that I got during my dissertation proposal from my major professor." "Trying to figure out the problems would help me," Participant 4 stated, referring to how the RWT facilitates a return to her writing. Related to learners' agreement with the statement on the post-task survey "The RWT tool helped me develop skills for writing research articles," one participant (P5) strongly agreed while all others agreed. Participant 5 realized "I needed to establish a territory more" and that "I needed to convince the reader" upon receiving RWT feedback indicating her lack of including some rhetorical elements in her draft. A number of participants also had explicitly used the adjective "helpful" in the stimulated recalls and open-ended survey response items. Participant 10 remarked that "the move feedback is helpful," Participant 6 called the Demonstration Module "helpful," and Participant 7 mentioned "the view above" (referring to the move range bar) as "helpful."

Finally, it is clear from the data triangulation that learners would like to use the RWT again to revise their RA section drafts. On the post-task Likert-scale survey item statements "The RWT tool is useful for improving research article writing skills" and "I would like to use the Research Writing Tutor again" Participants 10 and 5 strongly agreed, Participant 5 remembered "I had to think how do I put what is missing in my draft?" prompting her to re-examine the rhetorical intent in a subsequent revision of her draft. The same participant later called the RWT " a good study point," calling attention to the value of the tool in research article draft improvement. In the stimulated recalls, Participant 10 also called the RWT "a good reference," and claimed both the Demonstration Module and the move feedback were "helpful." Also, Participant 1 strongly agreed she would like to use the tool again, stating in the recall "It's just helping me."

Overall, results from the triangulation of data for answering RQ1a revealed generally positive perceptions of the RWT's usefulness, with many of the participants (P1, P2, P3, P5, P8, and P9) expressing strikingly more positive than negative *appreciation* of the RWT. Only two participants conveyed more negative than positive *appreciation* of the RWT and their

RWT experience. A comparison of the data reveals that some participants tended to remain more positive throughout their evaluation of the RWT and their RWT experience. This consistent positivity about the RWT tool is a hopeful finding, as it has been demonstrated that students' perceived effectiveness of an AWE tool is connected to how the tool is used and how frequently users return to the tool for revising their writing (Chen & Cheng, 2008; Grimes & Warschauer, 2010).

That participants responded with optimism about the future of the RWT and potential usefulness of the tool's feedback is also encouraging for developers of the RWT. It is possible participants' enthusiasm about the future of the RWT is a result of the nature of the feedback itself. One feature that has been shown to contribute to positive responses to AWE tools is the immediacy of the feedback. As Grimes and Warschauer (2010) have observed, instantaneous feedback is related to students' reports of increased motivation and more positive attitudes towards current and future use of the tool. Immediate feedback has further been shown to influence the amount and type of revisions AWE users make to their writing (Tuzi, 2004). However, it has also been demonstrated that instructional contexts of the use of AWE software impact learners' positive perceptions of automated feedback (Pujola, 2001). The pedagogical objective and the learning required to achieve that objective should therefore be thoroughly assessed before classroom integration of AWE tools like the RWT (Nagata, 1993) and even in determining students' perceived effectiveness of such tools.

Another variable possibly contributing to positive *appreciation* of the RWT's usefulness was the mere presence of additional feedback. As Grimes and Warschauer (2010) suggest, automated feedback, when provided in addition to the instructor's feedback, doubles the amount of feedback the student receives, resulting in positive reactions to an AWE tool.

Learners' positive *appreciation* of the RWT's usefulness may have been due, in part, to participants having received twice the amount of feedback in the writing process.

Participants' mention of human feedback in their *appreciation* of the RWT's usefulness is also not necessarily an exceptional finding, especially in light of results from past studies on the use of AWE software in draft revision. Grimes and Warschauer (2010), Hyland and Hyland (2006), Yang (2004), Chen and Cheng (2008), and Phakiti (2011) have all observed learners' tendency to instinctively relate automated feedback to human feedback, be it from their instructors, peers, or human raters; much of this research, however, has also shown that AWE users prefer their instructors' or peers' feedback to that received from an automated system. It could therefore be perceived as an optimistic finding in this study that no participants explicitly or implicitly mentioned a preference for human feedback over RWT feedback, an outcome confirming the finding the RWT users found the AWE program to be "helpful" to them in their draft revision.

There was, however, negative *appreciation* and *affect* conveyed in the qualitative data, particularly in terms of the RWT's ease of use, functioning of the RWT analyzer, and confusing feedback from the RWT analyzer. While the inaccuracies learners noticed in the RWT feedback had an undoubtable influence on negative evaluations of the RWT's usefulness, previous studies have shown that the formulaic character of machine-produced feedback (Grimes & Warschauer, 2010; Yang, 2004) and AWE tools' difficulties recognizing complex content development in student writing (Chen & Cheng, 2008) promote AWE users' closer inspection of their writing. In other words, while the repetitiveness of the feedback and the RWT analyzer's inability to recognize the sentences' intended rhetorical functions may have led students to convey negative *appreciation* and *affect*, it may also have incited close re-reading of their drafts and reconsideration of whether their rhetorical meaning was conveyed as clearly as the writer had intended. Learners' reported willingness to make changes to their writing based on the RWT feedback confirms that the AWE tool did indeed stimulate writers' return to and close reexamination of their texts, a foremost goal of the RWT.

To summarize, results from the quantitative and qualitative data analyses in response to RQ1a on the perceived usefulness of the RWT showed that learners are not only are positive about the current usefulness of the tool, but also excited about potential uses for the RWT among other colleagues and themselves in future research article composition. A number of specific and general suggestions were made by learners to improve usefulness of the tool, and several concerns were raised about the inaccurate feedback provided in the Analysis Module. A triangulation of the results showed similarly positive perceptions of users' experience with RWT and reactions to the tool itself, with some visible trends in positive and negative individual participant responses to statements about the RWT's usefulness.

Section 4.2. RQ1b- Learner Trust in the RWT

To answer RQ1b —*To what degree do learners trust the RWT tool?* — quantitative and qualitative analyses were again employed. Similar to the results presented for RQ1a, results from each quantitative and qualitative analysis will be presented prior to the results of the data triangulation.

Executive Summary

Analyses conducted to answer RQ1b on learner perceptions of trust in the RWT tool showed overall hesitation to fully trust the RWT or RWT feedback. Findings from the descriptive statistical analysis of Likert-scale responses on the post-task survey showed that not only were participants hesitant to fully trust the RWT or RWT feedback, but also other automated systems. While many learners agreed that their expectations for RWT interaction were met, some learners felt the RWT draft revision experience fell short of their expectations.

The analysis of APPRAISAL resources learners used in their post-task survey responses and stimulated recalls show more negative than positive *appreciation* of the RWT and RWT feedback in discussions of trust in the tool. Negative evaluations of trust in the RWT converged primarily on the inaccuracies users observed in the RWT feedback when the RWT analyzer's feedback did not coincide with the students' intended rhetorical meaning of their discourse. Learners commonly related their positive *appreciation* of trust in the RWT and RWT feedback to the RWT's functioning, connecting the perceived capabilities of the tool to the degree of trust they currently place in the tool and will potentially place in the tool if feedback accuracy is improved. An analysis of APPRAISAL resources used to scale learner *appreciation* of trust in the RWT showed that greater numbers of low-scaled graduation resources were used than medium- or high-scaled resources, commonly through use of lexicogrammar such as "maybe," "quite," or "less," indicating learners' inclination to indecisively commit to their judgments concerning trust in the RWT.

Findings from an analysis of learners' emotions expressed when discussing their trust in the RWT shows more negative than positive *affect* conveyed. Interestingly, the analysis of qualitative data uncovered three prominent sets of themes relating respectively to positively and negatively charged *affect*: certainty/uncertainty, confidence/lack of confidence, and awareness/lack of awareness. Participants reported feeling "sure" or "unsure" about their writing or what was happening in their RWT draft revision experience. The RWT feedback also seemed to at times either "boost confidence" or "shake confidence" of the learners with respect to how they perceived their draft revision process. Finally, learners responded emotionally to the RWT through indications of their "consciousness" during the process, or recognition they were "not aware" of how to proceed with the analysis or interpret the feedback.

Together, the analyses reveal that participants were reluctant to place complete trust in the RWT and related the ability to trust the tool to perceived inaccuracies in the analyzer's feedback. Detailed findings from and discussions of the Likert-scale survey response data analysis and APPRAISAL analyses are provided in the following subsections.

Quantitative Analysis for RQ1b

Learners' responses to Likert-scale items regarding their trust in, and expectations for, the RWT showed hesitation to completely trust the RWT and its provided feedback. After adjusting question wording and normalizing the responses, the Median, Mean, and Standard Deviation for each statement were calculated, provided in Table 4.2-1.

Table 4.2-1

Descriptive Statistics for Likert-Scale Items on Trust in the RWT

Post-Task Survey Item	Mean	Median	St. Dev
To what degree do you trust automated writing evaluation systems.*	2	2.09	0.3
I trust automated writing evaluation systems.	3	2.63	0.5
I trust the Research Writing Tutor.	3	2.72	0.47
The feedback provided by the RWT met my expectations.	3	2.63	0.5
My overall experience with the RWT met my expectations.	3	2.72	0.47

Note. N= 11. First four item responses based on a Likert-scale where 1= strongly disagree and 4= strongly agree. *=item included on pre-task questionnaire where 1=no trust and 4 = complete trust.

The results shown in Table 4.2-1 indicate that learners were cautious about reporting full trust in the RWT, or even in automated writing evaluation programs as a whole. While the Mean scores for all statements suggest that learners agreed with statements about trust in the RWT and believe that the RWT met their overall expectations, lower Median scores (ranging from 2.09 to 2.72) point to a reluctance to trust the RWT and potentially other AWE tools.

Prior to engaging in draft revision with the Research Writing Tutor, 10 of the 11 participants remarked they only had “some trust” in automated writing evaluation systems, and one participant (P8) indicated he had “much trust” in AWE tools. After interacting with the RWT to revise their draft, four participants disagreed with the statement “I trust AWE systems,” while the remaining seven agreed. Because identical test items were not included in both pre- and post-task surveys, it is unfortunately not possible to ascertain a direct increase or decrease in learners’ levels of trust in automated writing evaluation systems as a whole. However, there is a difference is students’ report of trust in AWE systems in general versus the RWT specifically. Eight of the 11 participants agreed with the statement “I trust the RWT,” while three disagreed. (No one indicated strong agreement or disagreement.) Upon closer inspection of the individuals’ scores, it seems two participants (P2 and P6) reported more trust in the RWT (marking “3” on the scale) over automated writing evaluation tools as a whole (marking “2” on the scale), while one participant (P4) stated she trusted other AWE programs (marking “3” on the scale) more than the RWT (marking “2” on the scale). The other eight participants noted identical degrees of trust in both the RWT and other AWE programs.

In terms of the learner expectations, eight of the 11 learners agreed their overall draft revision experience with the RWT met their expectations. Three learners disagreed that their expectations were met, and no learners strongly disagreed nor strongly agreed with the statement. Seven of 11 participants agreed and three participants disagreed that the RWT feedback met their expectations.

To review, these Likert-scale response results show that learners were tentative to trust not only the RWT, but also other automated writing evaluation programs. Unfortunately, it cannot be determined whether learners' trust in automated writing evaluation systems increased or decreased after their RWT interaction, as no questions regarding trust in AWE programs were included on the pre-task questionnaire. Learners' trust in the RWT was slightly higher than trust in automated writing evaluation systems post-RWT interaction, however. It may be that learners' reluctance to trust the RWT or automated systems derives from a general lack of trust in automated systems. The elevated increase in trust in the RWT versus other AWE systems could be the result of learners' limited or, perhaps nonexistent, previous interaction with other AWE tools for revising their writing. In other words, because participants' were more familiar with the RWT and may have had limited experiences with other AWE tools, they were more willing to trust the RWT over other AWE programs.

Additionally, many learners agreed their expectations for both their RWT draft revision experience and the RWT feedback met their expectations, though some participants' expectations were not met. As Lee and See (2004) observed, a technology users' expectations about what a program offers impact the users' trust in and reliance on the automated system. It is possible the limited interaction some participants had had previously with automated systems also contributed to their lessened expectations for what they would gain from these tools.

Appraisal (Quantitative +Qualitative) Analysis for RQ1b

Systemic functional analyses of participants' qualitative data — open-ended responses on the post-task survey and transcripts of stimulated recalls — reflected similar results to the Likert-scale questionnaire responses in that participants were reluctant to place complete trust in the RWT. The following section provides a detailed breakdown of the analysis of each Appraisal resource analysis targeted at participants' trust in the RWT. Results from the *appreciation* resource analysis are first reported, followed by results from an analysis of the *engagement* resources participants used to discuss their trust in the tool. The *graduation* resource analysis results are presented according to the *appreciation* and *engagement* resource analyses. Finally, results from the *affect* analysis are presented. As with RQ1a, frequency tallies of each Appraisal resource (quantitative results) are provided along with a detailed description of the types, charges, and examples of each resource (qualitative results).

Appreciation analysis for RQ1b. Analyses of participants' use of *appreciation* resources for evaluating their degree of trust in the RWT showed that learners conveyed more negative than positive evaluations in statements expressing their trust in the tool. Because much less *appreciation* was expressed with regards to issues of trust in the RWT tool (and because only two *appreciation* resources were used in the open-ended surveys), this subsection presents results from a combined analysis of *appreciation* resource use in both open-ended survey responses and the stimulated recalls. Table 4.2-2 provides a breakdown of the frequencies of the positive, negative, and neutral *appreciation* resources used by participant as well as group totals in the open-ended survey and the stimulated recalls. The columns labeled "projected positive" or "projected negative" show total tallies for resources used to convey *appreciation* of the RWT, RWT feedback, or RWT experience, in a hypothesized or future potential scenario.

Table 4.2-2

Frequency Count for Appreciation Resources in Open-Ended Survey Responses and Stimulated Recalls

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Appreciation* Resource Total
P1	3	0	2	0	0	5
P2	1	0	2	0	0	3
P3	3	0	0	0	0	3
P4	1	0	0	0	0	1
P5	2	0	12	0	3	17
P6	1	0	0	0	0	1
P7	1	1	10	0	1	13
P8	0	0	0	0	0	0
P9	3	2	5	0	0	10
P10	0	0	3	0	0	3
P11	0	0	0	0	0	0
TOTAL	15	3	34	0	4	56

Tallies from participants' statements regarding their *appreciation* of the RWT in terms of trust in the tool showed that more negative *appreciation* than positive *appreciation* was expressed. In total, 18 of the 56 (32%) *appreciation* resources used in discussing learners' trust in the tool were positively (positive plus projected positive resources) charged, while 34 of the 56 (61%) were negatively charged, and 4 of the total (7%) amount were neutral.

However, an analysis of individuals' responses reveals that the number of participants who expressed positive or negative evaluations of their trust in the RWT were relatively equal, with more participants (five of the nine who conveyed *appreciation*) expressing positive evaluations of the their trust in the tool, and four of the nine conveying negative evaluations. Two participants (P8 and P11) expressed no statements of *appreciation* regarding trust in the RWT. What may be deceptive concerning the overall tallies of *appreciation* is the fact that two participants (P5 and P7) expressed great amounts of negatively charged *appreciation* of the RWT in statements about their trust in the AWE program.

The inaccuracy of the feedback students received when entering their drafts in the RWT Analysis Module was a central focus of the negative evaluations of trust (of lack thereof) in the RWT. When the learners felt the Analysis Module's feedback did not match with their rhetorical intent in a sentence, they deemed the RWT feedback inaccurate; in their open-ended survey responses and stimulated recalls, learners frequently spoke of these inaccuracies with regard to the degree of trust they placed in the tool. Perhaps the most telling of this inaccurate feedback-lack of trust connection can be observed in the overwhelmingly negative response of Participants 5 and 7, who convey far more negative than positive *appreciation* of the RWT in terms of trust. Participant 5 remarked "I had harder time trusting [-*appreciation*] it when the RWT doesn't analyze my sentences correctly." This same participant later commented "if it gives you a statistical significance and then you realize that, ah, this was not the case, that would be problematic [-*appreciation*];" in this quote, the learner suggests that if a student was led to believe the percentage of moves or steps was actually what appeared in the text, then realized the feedback was inaccurate, it may create problems for a student in draft revision. In yet another statement, Participant 5 directly draws a close relationship to inaccuracy of RWT feedback and learner trust in the

RWT, claiming "I think, whichever way, the level of accuracy needs to be [-*appreciation*] for people to trust it," implying that the analysis accuracy level is not yet at the point of being capable of generating trust.

Notions of dissipating trust as participants progressed through their RWT draft revisions were also uncovered in the *appreciation* analysis. Also, Participant 7 commented "I was less likely to trust [-*appreciation*] what I was being told in terms of its relevance to my field" when it was clear "there became issues [-*appreciation*] with the analysis." The same participant later confirmed her correlation of the RWT providing inaccurate feedback and her consequential loss of trust in the tool, stating outright "I started to distrust it [-*appreciation*] when the tool didn't agree;" in other words, when the learner recognized the RWT providing feedback that did not fit with her intended meaning in a sentence, she began to lose trust in the tool. She later warned that the tool has "the potential to create confusion [-*appreciation*]," presumably cautioning future users of the RWT about possible misunderstandings that could result when using the AWE tool for draft revisions.

Many negative *appreciation* resources simply conveyed lack of a willingness to completely trust the RWT or the RWT feedback. For example, Participant 1 noted "I cannot trust this tool 100%," and later mentioned "There are times that I don't believe it," signaling an inability to trust the RWT or the RWT feedback at all times. Participant 9 made a similar comment about not being able to trust the RWT all the time, mentioning "I didn't trust it [-*appreciation*] when sometimes it wasn't what I thought." Participant 9 later asked to stop the screen recording video in the stimulated recall and stated, "This is an untrust point [-*appreciation*] for me," indicating a defined moment when she did not trust the tool (because of inaccurate feedback she felt the RWT was providing). Likewise, Participant 5 mentioned

"There are some things I would take [+*appreciation*] about what it tells me, and there are some things I wouldn't take [-*appreciation*]," conveying a stance that speaks to the learners' skepticism of completely taking all the feedback as usable or applicable to her section draft revisions.

Expressions of positive *appreciation,* though less frequent, also commonly tied perceptions of trust in the RWT to functioning of the RWT analyzer. "You know, I do trust [+*appreciation*] it," Participant 3 noted, because "it will recognize [+*appreciation*] it based on what I intend to do;" these statements relate the participant's trust in the RWT to how well the RWT is able to recognize his rhetorical intentions. Participant 7 also connected her trust in the RWT to its ability to accurately pick up the student's intent, stating "I would trust it [proj. +*appreciation*] more later" when the accuracy is improved. One participant (P1) was less specific about what motivated her trust in the RWT, simply stating her outright trust twice in the stimulated recalls "I can trust [+*appreciation*] this tool" and "I can trust [+*appreciation*] the analysis." Yet another learner pointed to her trust in the RWT as related to value of what the program is able to do for her as she revises her drafts, saying "RWT is giving a good indication [+*appreciation*] of what to improve." Therefore, it seems the learners not only also connected their statements of trust in the RWT to perceptions of accuracy, but also to the affordances the RWT could offer them in their draft revision.

In evaluations of trust in the RWT, learners were divided. Though the overall tallies of resources show more negative than positive *appreciation* of trust in the RWT, learners' individual reported levels of trust in the tool were roughly split in half between negative and positive *appreciation*. When learners felt the Analysis Module feedback did not match their rhetorical intent, they deemed the feedback inaccurate and, as a result, lost trust in the AWE tool; one RWT user (P7) outlined her gradual loss of trust precisely in this way, commenting that she started out trusting the tool, but that her trust steadily dissipated with the more inaccurate feedback she received. Connecting these results to findings from RQ1a on perceived usefulness in the RWT, previous research has found that recognized inaccuracies with the automated feedback correspond not only to diminishing trust in the automated system, but also perceptions of the usefulness of the tool and the tool's feedback (Chang & Tung, 2008; Davis et al., 1989). Furthermore, Cotos (2011) and Hyland (2003) hold that students' perceptions of a tool's capabilities also impact their opinions about the tool's usefulness. It is thus possible that learners' perceptions of usefulness of the RWT relates to what they thought the tool was or was not capable of accomplishing (i.e., providing accurate feedback). It is not unreasonable to posit that participants' skepticism of the RWT, whether or not rooted in an acknowledgement of the system's limitations, may have negatively affected their perceptions of its effectiveness.

Results also show learners' tendency to connect their negative appreciation of trust in the RWT and RWT feedback to skepticism about using all the feedback or unwillingness to completely trust the tool. The hesitance to use all the RWT feedback is reflected in the individuals' unwillingness to use some parts of the tool or feedback as they made revisions to their drafts. It is possible learners' reluctance to completely trust the RWT related to unstated preferences for human feedback. Previous studies by Yang (2004) and Hyland and Hyland (2006) reveal that L2 learners showed less favorable reactions toward the AWE feedback compared to instructor-provided feedback. Yang suggests it may be students' expectations for more meaning-focused feedback, as opposed to the form-focused feedback typically provided by AWE programs, which leads students to prefer their instructor's feedback.

However, in learning scenarios in which AWE feedback is included as a step in the already existing social writing process and involves students in receiving AWE feedback as an additional resource to peer or teacher feedback, students respond more favorably to the AWE feedback (Grimes & Warschauer, 2010). Though the RWT strives to provide not form-focused feedback, but rather feedback that targets the meaning of the sentence with regards to the function it achieves, it would still be critical for teachers using the RWT and other AWE programs in their writing instruction to integrate the technologies in a way that is supplemental to the human instruction, feedback, or review.

On the other hand, the RWT's inaccuracies may also have been beneficial to the students by offering the occasion to return to their writing for more intense examination. Perhaps receiving the inaccurate feedback prompted students to reflect more deeply on their writing and their intended meaning (Yang, 2004), providing the opportunity for students to notice more closely the detailed elements of their writing and thus facilitating deeper engagement with their texts (Nix & Wylie, 2011). In the end, the process of identifying the RWT's incapacities may well have supported an increase in students' motivation to return to their writing for closer inspection (Grimes & Warschauer, 2010). In other words, though learners may have negatively evaluated their trust in the RWT, the goal of the RWT was still met in that the process of RWT users discerning whether or not the tool's feedback was accurate engaged the writers in closer reexamination of their original rhetorical intent.

Participants' positive *appreciation* of trust in the RWT was frequently conveyed through learners' recognition of affordances of the RWT and suggestions for what would need to be improved to enhance learner trust in the tool. As Scharber, Dexter, and Reidel (2008) found, language learners' consciousness of an automated system's strengths and weaknesses assist the CALL program user in determining the level of trust they can place in the technology. Because, as the authors also found, students' trust in an AWE system is related to their willingness to use the tool again, RWT users' readiness to make recommendations for improving the tool is encouraging, as it denotes students' investment in the RWT's development and, potentially, indicates a desire to use the RWT for future draft revisions.

Table 4.2-3

Frequency Count for Graduation of Appreciation in Open-Ended Survey Responses and Stimulated Recalls

Participant	Positive	Projected Positive	Negative	Projected Negative
P1	0	0	0	0
P2	1	0	1	0
P3	0	0	0	0
P4	1	0	0	0
P5	0	0	3	0
P6	1	0	0	0
P7	0	1	4	0
P8	0	0	0	0
P9	2	1	1	0
P10	0	0	1	0
P11	0	0	0	0
TOTAL	5	2	10	0

Another important part of answering RQ1b was the *graduation* analysis, which analyzed how participants scaled their *appreciation* of their trust in the RWT. Table 4.2-3 shows a frequency count for the participant use and overall use of *graduation* resources used for *appreciation* in learners' responses on the open-ended survey.

What this tally shows is that learners graded their evaluations of trust in the RWT in similar ways in terms of positive and negative *appreciation*. Though there were few *appreciation* resources used overall in statements about learners' trust in the RWT, the table above provides some indication of how the participants graded their expressions of trust in the RWT and RWT feedback. While many more negative than positive *appreciation* resources were used to evaluate learners trust in the RWT (as see in Table 4.2-2), Table 4.2-3 shows that only three more negative *graduation* resources (10 total negative) than positive *graduation* resources (7 total positive) were used to scale learners' statements of trust in the RWT. The same participants (P5 and P7) who convey more negative *appreciation* of the RWT in terms of trust in the tool also used the most resources to scale up or down their assertions about trust in the AWE program.

In addition to the tallying of graded *appreciation* resources by participant, the strength of the *graduation* resources was also analyzed to determine the degree of learners' statements about trust in the RWT. A summary of the grade (low, medium, or high) of participants' *graduation* resources is provided in Table 4.2-4, and is labeled by the positive or negative charge of the resource.

What can be observed in Table 4.2-4 is the intensity with which learners expressed their evaluation of the RWT in discussing their trust in the tool. Far more low-ranked resources were used to scale learners' appreciation of the RWT, and this is true for both

Table 4.2-4

Graduation Resource Rank by Appreciation Charge in Open-Ended Survey Responses and Stimulated Recalls

Appreciation Charge	Low	Med.	High
Positive	2	2	2
Negative	9	1	1
TOTAL	11	3	3

negatively and positively charged evaluations. Both medium-scaled and high-scaled graduation resources were used three times each, with two positive *appreciation* charges in both categories and one negative *appreciation* charge in each category.

The types of *graduation* resources participants used to scale their perceptions of trust in the RWT were similar to those used to scale their *appreciation* of the usefulness, as was analyzed in answering RQ1a. Low-scaled *graduation* resources, the most commonly used rank of *graduation* resources in discussions of trust in the RWT, were “less,” “quite,” and “maybe.” “I would trust the RWT tool for student analysis maybe [low *graduation*] 50/50 [-*appreciation*]” Participant 4 stated, while Participant 7 remarked “I was less [low *graduation*] likely to trust [-*appreciation*] what I was being told in terms of its relevance to my field” and “I didn’t quite [low *graduation*] agree with [-*appreciation*] the analysis.” The number of low-ranked *graduation* resources suggests learners’ less intense evaluation of their degree of trust in the RWT. Medium-ranked resources included use of the adverb “really,” as in Participant 1’s statement “There are times that I really [medium *graduation*] don’t believe [-*appreciation*] in it,” and “a lot,” such as in Participant 7’s perception about future projected trust in the tool, stating “I would trust it [proj. +*appreciation*] a lot more [medium *graduation*] later.” The few high-ranked *graduation* resources learners used conveyed complete mistrust or trust in the RWT or feedback, such as Participant 2’s acknowledgement, “I know that, of course, it cannot be totally [high *graduation*] objective [-*appreciation*].” Participant 9 was hopeful that she would have enhanced trust in the tool, if the RWT had a corpus in her discipline, stating “I think if I see my discipline I say again I can trust it [proj. +*appreciation*] fully [high *graduation*].”

The increased use of low-scaled *graduation* resources over medium- or high-scaled *graduation* resources is particularly noteworthy in consideration of the wording of RQ1b asking "*To what degree* do learners trust the RWT?" Participants' use of more low-scaled *graduation* resources likely points to participants' desire to soften their negative *appreciation* of their trust in the RWT (Lakoff, 1973). Instead of using stronger lexicogrammar to amplify their evaluative statements about trust in the RWT (Labov, 1984; Lakoff, 1973), participants preferred to use more vague language to temper their primarily negative *appreciation* of the RWT in terms of trust in the tool and the tool's feedback (Channell, 1994). Because so few medium-scaled or high-scaled *graduation* resources were used to express evaluations of trust in the RWT and RWT feedback, it seems learners were more tentative about communicating strong negative evaluation of their trust in the RWT. Thus, while it seems learners were primarily negative in their evaluations of trust in the tool, this negativity was expressed with hesitance, possibly signaling learners' indecision in committing to their declarations of trust in the AWE tool.

Discerning the extent to which learners evaluated their trust in the RWT is important, because degrees of human trust in automated systems have been shown to relate to how operators exploit the tools (Lee & Moray, 1994; Muir & Moray, 1996). Yet increased trust in a system does not inherently equate proper use of the tool for language development; how users' trust in a technology is grown is a dynamic process that is immensely important to the level of dependence the user ends up developing on the program (Lee & See, 2004). As Lee and See assert, excessive amounts of trust in a system may contribute to a user's over-reliance on automated tools and/or the tool's feedback. It is critical therefore critical that

RWT user trust be gauged at varying stages in learners' use of the tool for draft revision so undue dependence on the RWT feedback does not emerge.

In sum, the *appreciation* analysis and corresponding *graduation* analysis revealed that learners seemed unable to articulate complete trust in the RWT. Hesitance to place trust in the RWT or RWT feedback was frequently linked to statements about erroneous feedback the tool was providing. A larger use of low-ranked *graduation* resources used for expressing perceptions of trust in the RWT showed a lesser degree of intensity with which participants felt trust and mistrust in the AWE program.

Affect analysis for RQ1b. In addition to the presence of emotional reactions in their discussions of the RWT's usefulness, a close examination of the data also revealed that learners conveyed emotions in their discussions of trust in the RWT. As was revealed in preliminary analyses of data in answering RQ1a, analyses for answering RQ1b also showed the presence of *affect* resources connected to expressions of learner perceptions about trust in the RWT and RWT feedback. Therefore, early on in the coding process it was determined that an analysis of *affect* resources may help to shed light on how learners conveyed trust in the RWT. An analysis of *affect* resources learners used when communicating their degree of trust in the RWT showed that substantially more negative *affect* was conveyed than positive *affect*. Table 4.2-5 provides a summary of the total number of *affect* resources used by participants in both the open-ended survey responses and the stimulated recalls. Data are organized by the charge (positive or negative) of the *affect* resources used.

As evidenced in the table, the majority of *affect* resources participants used in discussing their trust in the RWT were negatively charged, implying participants expressed more negative emotions in their discussions of trust in the RWT and RWT feedback.

Table 4.2-5

Frequency Count for Affect *Resources in Open-Ended Survey Responses and Stimulated Recalls*

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Affect* Resource Total
P1	2	0	1	0	0	3
P2	0	0	0	0	0	0
P3	0	0	0	0	0	0
P4	0	0	0	0	0	0
P5	0	0	2	0	0	2
P6	1	0	8	0	0	9
P7	0	0	5	0	0	5
P8	1	0	3	0	0	4
P9	0	1	4	0	0	5
P10	1	0	1	0	0	2
P11	0	0	0	0	0	0
TOTAL	5	1	24	0	0	30

Negatively charged resources accounted for 80% (24 of the 30 total *affect* resources), while positively charged resources accounted for the remaining 20% (6 of the 30 total). No neutral *affect* resources were used in the data corresponding to RQ1b. What is also clear form Table 4.2-5 is the variation in individual participants' use of *affect* resources in their evaluations of their trust in the RWT. Some participants (P2, P3, P4 and P11) used no *affect* resources whatsoever, while others (P1, P5, and P10) used two to three resources, and the remaining participants (P6, P7, P8, and P9) used from four to nine *affect* resources.

A qualitative analysis of both positively and negatively charged *affect* resources revealed prominent theme sets of certainty/uncertainty, confidence/lack of confidence, and awareness/lack of awareness, corresponding respectively to positive and negative charges. Many positive *affect* resources used by participants were concerned with their being "sure" about their writing, the tool's analysis, or functioning of the tool. Participant 1 recalled "I was sure [+*affect*] what I was trying to read" when perusing the Demonstration Module examples; then, in discussing specific feedback from the RWT analyzer's on her draft, she stated "I was sure [+*affect*] of my sentence." Receiving feedback which was in line with learner expectations for what rhetorical intention they were aiming to accomplish was also perceived as "reassuring." Participant 8 mentioned "So when I saw a whole bunch of blue at the beginning, that was reassuring [+*affect*]," as the learner had indeed intended the first part of his Introduction section to be Move 1 (indicated by the blue color code). Participants also spoke of their awareness of the tool and its functioning, with Participant 10 remarking "I was conscious [+*affect*] of the key words that the software might think was a different move." Finally, a further theme in the use of positive *affect* resources was the RWT's ability to promote confidence. Participant 9 commented that the capability to select a discipline closest to hers "helps me feel confidence [+*affect*] for the tutor." Also, Participant 6 directly related a sense of heightened confidence to the RWT analyzer's corroboration of a function she intended to fulfill in the sentence, saying "So, to a certain extent, if it was confirming my work, it was boosting my confidence [+*affect*]."

An analysis of the negative *affect* resources participants used to discuss trust in the tool also revealed themes revolving around learners' uncertainty, lack of confidence, and feelings of unawareness while using the tool. Much *affect* conveying uncertainty manifested in the utterance "I'm not sure." Participant 1 remarked "I'm not sure [-*affect*] about what I wrote in the RWT was good enough just to add it into my paper," expressing lack of confidence in trusting if what she revised in her draft according to the RWT feedback was suitable to add to the next draft. Participant 5 directed her uncertainty at a particular feature of the RWT, mentioning "I'm not sure [-*affect*] how helpful [the Demonstration Module] was," expressing skepticism about the helpfulness of the examples she found in the

Demonstration Module. Most uncertainty, however, was directed at the RWT analyzer. For example, Participant 7 remarked "I'm not quite sure [-*affect*] if the computer was accurately picking up whether it was a citation or not," communicating a lack of certainty about what the RWT analyzer was or was not capable of doing. The same participant later mentioned a particular move the RWT analyzer had difficulty picking up, causing a lack of clarity for the student: "I might have been less clear [-*affect*] with what the computer was doing with Move 3."Another participant (P9) stated "I don't know [-*affect*] why after I put it at etcetera, then it didn't understand it as a new sentence," voicing uncertainty about the analyzer's ability to recognize the start or end of a sentence. Participant 6's uncertainty concentrated on the RWT analyzer's capacity to pick up on references used in the text. This uncertainty was conveyed in a number of statements Participant 6 made in the stimulated recall: "I'm not sure [-*affect*] it was picking up on it," "I wasn't sure [-*affect*] if it was clear where the references were," and "I'm not sure [-*affect*] it knows the style that I use."

Yet further negative *affect* was conveyed through participants' statements expressing a lack of confidence or lack of awareness. "When things didn't agree, then that shook my confidence [-*affect*]," Participant 7 commented on the lack of agreement between her intended rhetorical function in a sentence and the RWT's analysis of that sentence. Participant 6 expressed a lack of awareness about how her actions during draft revision impacted the RWT's analysis results, stating "I'm not always aware [-*affect*] that just by switching from 'was' to like 'has been' really does change the meaning of the sentence."

Additional themes of concern and hesitance were also conveyed in participants' use of negative *affect* resources to talk about their trust in the RWT; these negative resources were occasionally associated directly with learners' trust, or lack thereof, in the AWE program. “I was concerned [-*affect*] about the red part,” Participant 9 asserted, expressing worry that the RWT analyzer did not recognize Move 2 (indicated by the color red) in her draft. Participant 7 felt cautious about the analysis results, remarking “The fact that there wasn’t much of anything in my specific field made me more hesitant [-*affect*].” At times the expressed negative *affect* was linked to explicit articulations about participants’ lack of trust in the RWT. Participant 9, for instance, stated her distrust of the tool outright claiming “That (this) discipline is not my own discipline makes me untrustful [-*affect*].”

The variation in participants’ use of *affect* resources speaks to the degree of variation with which learners engaged emotionally with the tool. Whereas some users used numerous *affect* resources, some participants expressed no *affect* whatsoever in their discussions of trust in the RWT. That learners expressed more negative than positive *affect* in the stimulated recalls and open-ended survey responses seems to relate to the cited uncertainty, lack of confidence, and lack of assurance participants felt in their interactions with the RWT during revision of their drafts. As the participants reported, when inaccurate feedback was received from the RWT analyzer, or “when things didn’t agree” (P7), they increasingly felt more “unsure” about the functioning of the RWT and more uncertain about their ability to trust the tool. Because learner trust in a system is connected to how confident users are in the human–computer interaction and how willing they are to take action based on the program’s recommendations (Madsen & Gregor, 2000), joint investigations of how RWT users develop trust in the tool and how this impacts their RWT experiences would perhaps help the system developers understand writers’ willingness to act on feedback they received from the automated system.

Learners' expressions of uncertainty through negative *affect* should not, however, be automatically taken as a discouraging finding. Grimes and Warschauer (2010) warn that students' as well as instructors', lack of awareness of the capacities and shortcomings of an AWE tool may lead to unwarranted trust in the tool. For example, as technology users become aware of a program's human-like capabilities, learners and sometimes instructors may begin to judge the software as being able to provide feedback equally reliable or valuable to that of a human, what Grimes and Warschauer (2010) term "the halo effect." Technology users who distinguish software as human-like then may start to esteem the machine as a social actor and as capable of critiquing the student work as a skillful instructor might (Reeves & Nass, 1996). Therefore, RWT users' recognition of the tool's abilities and inabilities prior to draft revision may help ensure appropriate levels of certainty are encouraged during learner–RWT interactions.

Triangulation of Quantitative and Qualitative Results

Triangulating the results of the quantitative and qualitative data showed that, as a whole, learners tended to express more negativity in discussions of trust in the RWT in the qualitative data than they indicated in the quantitative Likert-scale survey response data. An analysis of individual participant responses showed some similarities in learners' positive or negative attitudes in discussing trust in the RWT, with RWT feedback surfacing as a key source of diminished trust in the tool.

Because qualitative data sources were combined in the analysis of *appreciation* resources pertinent to learners' trust in the RWT, a comparison of *appreciation* resource use in the open-ended survey responses and stimulated recalls (as was conducted for RQ1a) is unnecessary. What still may be telling is a visual illustrating the positive versus negative charges of the *appreciation* resources participants used in the open-ended surveys and stimulated recalls. Figure 4.2-1 gives a visual of the percentages of each charge of *appreciation* resource for evaluating the participants' trust in the RWT. Positively charged (including both positive and projected positive) *appreciation* represents 35% (18 of 52) of charged *appreciation* expressed, whereas negatively charged (including both negative and projected negative) *appreciation* represents 65% (34 of 52) of overall charged *appreciation.*

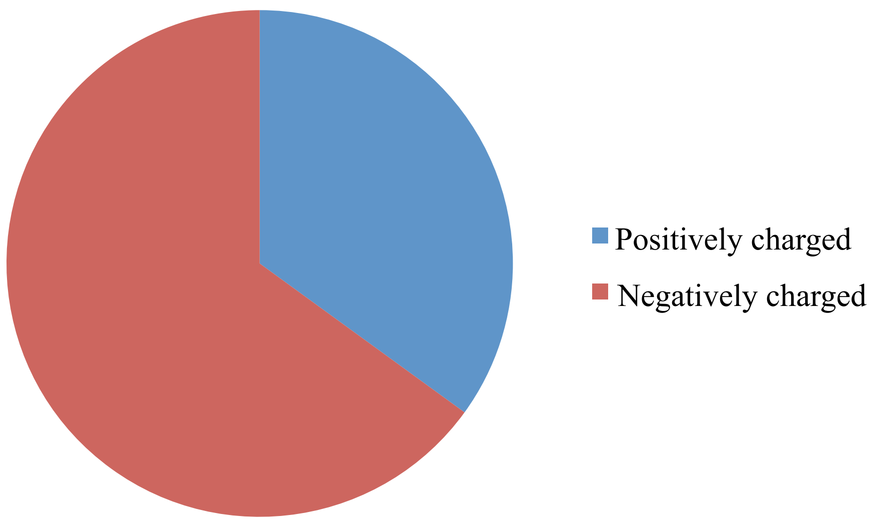


Figure 4.2-1. Distribution of *appreciation* resource charges in open-ended survey responses and stimulated recalls

This trend was noted in the earlier described *appreciation* analysis conducted to answer RQ1b and only depicts the entire participant group's collective bend towards negative *appreciation* when discussing learner trust in the RWT. A visual illustrating a breakdown of positive and negative *appreciation* by participant (see Figure 4.2-2 makes more distinct the individual learner tendencies towards positivity or negativity in their evaluation of their trust in the RWT.

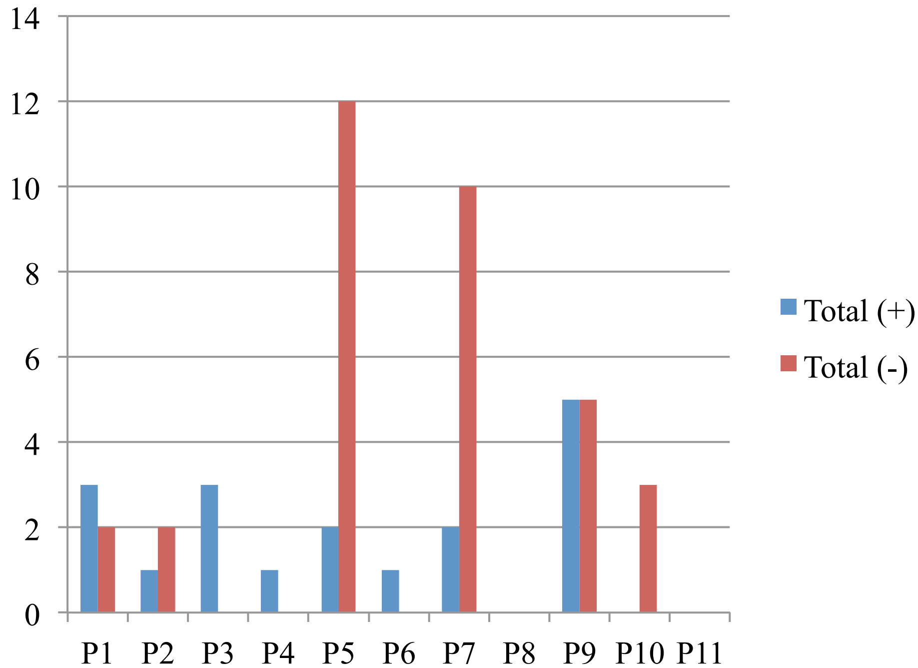


Figure 4.2-2. Total of positive and negative *appreciation* resources used by participant (P=participant) in open-ended surveys and stimulated recalls

What is immediately apparent from the visual is the heightened use of negative *appreciation* by two participants in particular (P5 and P7). Participant 2 conveyed more negative than positive *appreciation* of her trust in the RWT and Participant 10 conveyed only negative *appreciation*. Three participants (P3, P4, and P6) conveyed only positive *appreciation* and Participant 1 *appreciated* trust in the RWT more positively than negatively. Participant 9 expressed equal amounts of positive and negative *appreciation* and Participants 8 and 11 did not discuss trust in the RWT in terms of *appreciation.*

When comparing these *appreciation* tallies to the Likert-scale survey responses on trust in the RWT, individuals' responses are somewhat less distinct. As can be seen in Table 4.2-6, no learner indicated they felt complete trust in the RWT (which would be designated by a response of "4" on the 4-point Likert scale), nor did any participant indicate they had no trust (which would be designated by a response of “1” on the 4-point Likert scale) in the RWT.

Table 4.2-6

Participant Responses to Likert-Scale Post-Task Survey Questions Concerning Learners’ Trust in the RWT

Likert-Scale Survey Response Item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
The feedback provided by the RWT met my expectations.	3	3	3	2	3	3	2	2	3	3	2
My overall experience with the RWT met my expectations.	3	3	3	2	3	3	3	2	3	3	2
I trust the Research Writing Tutor	3	3	3	2	3	3	2	2	3	3	3
I trust automated writing evaluation systems.	3	2	3	3	3	2	2	2	3	3	3

Note: Values correspond to 4-point Likert-scale survey where 1=no agreement, 4=complete agreement.

As the table reveals, participants varied in their reported degrees of trust in the RWT. Responding to the first statement about whether the RWT feedback met participants’ expectations, four learners (P4, P7, P8, and P11) only agreed slightly with the statement, while all other learners indicated more agreement; this shows more (seven of the total 11) participants felt the RWT feedback mostly met their expectations. Almost the exact same values were given in response to the statement about whether students’ overall experience with the RWT met their expectations. Only one participant (P7) agreed more with this statement than the previous statement about RWT feedback meeting her expectations, suggesting it was the RWT Analysis Module’s feedback, and not the entire RWT tool, which did not precisely meet her expectations. In response to the statement specifically stating “I trust the Research Writing Tutor,” Participants 4, 7, and 8 all marked a “2,” indicating little agreement with the statement, while all other participants marked a “3,” indicating more trust in the RWT. In terms of trust in automated writing evaluation systems, all participants marked the same trust in the RWT as other AWE programs, except for Participant 3, who trusted the RWT more, and Participant 4, who trusted other AWE technology more than the RWT. What can be deduced from this examination of individuals' Likert-scale survey responses is overlap in students' more negative evaluation of the tool in terms of trust; the same learners who believed the RWT feedback only slightly met their expectations (P4, P7, P8, and P11) were those who put slight trust in the RWT (P4, P7, and P8).

A visual of individual participant responses on the Likert-scale survey items are shown in Figure 4.2-3. In the figure, the y axis points to learners' Likert-scale rankings from 1 to 4 ("1" signaling no agreement with the statement and "4" signaling learners' complete agreement with the statement.) What is reflected in the visual is that no participant indicated extremes in her/his responses to the survey statements about trust in the RWT.

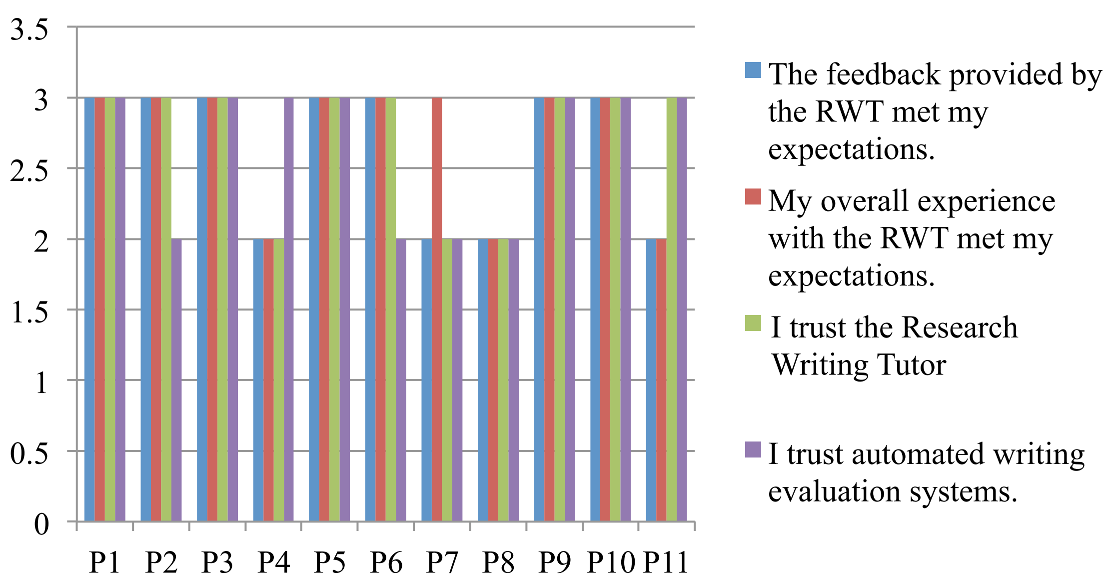


Figure 4.2-3. Participants' responses to Likert-scale items on post-task survey about learner trust in the RWT *Note:* X axis shows participant indicators; Y axis shows points 1-4 on the 4-point Likert-scale survey where 1=no trust, 4=complete trust.

A close comparison of learners' Likert-scale survey responses to the *appreciation* resource analysis could potentially shed light on participants' individual tendencies to positively or negatively evaluate the RWT in terms of their trust in the tool. Figure 4.2-4 below displays a comparison of the positive and negative *appreciation* resource tally in the

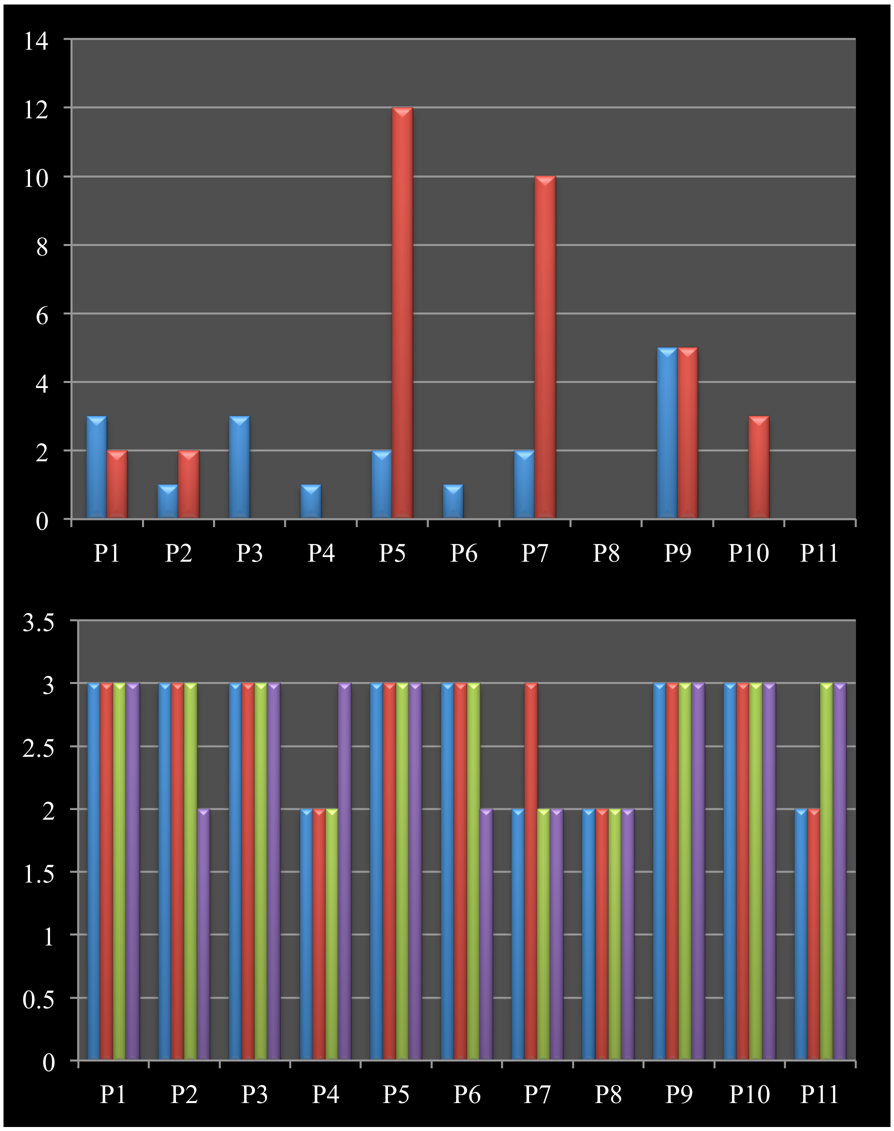


Figure 4.2-4. A within-participant comparison of positive (in blue) and negative (in red) *appreciation* resource use (in top chart) compared to degree of trust indicated in Likert-scale statements (in bottom chart)

qualitative data (in the top graph) and agreement with statements about trust in the RWT in participants' Likert-scale responses on the post-task survey (in the bottom graph). In both graphs, the X axis represents the participant identifier.

The juxtaposed figures allow an immediate within-participant comparison of learners' responses to the RWT across both qualitative and quantitative data sources. Conceivably, those individuals who were more negative in their *appreciation* of trust in the RWT (indicated by red in the top graph) would reflect lower numbers on the Y axis in the bottom graph (indicating less agreement with Likert-scale survey statements about the RWT meeting their expectations and them having trust in the tool). From the comparison allowed in Figure 4.2-4, it seems Participant 7 was consistently negative in her evaluations of trust in the RWT. Other participants showed less continuity in their negative or positive *appreciation* of the tool. For example, though Participant 5 was among the top two learners who indicated the most negative *appreciation* of her trust in the RWT in the open-ended survey responses and stimulated recall data, her Likert-scale survey responses were in line with other learners on the in terms of trust in the RWT and automated writing evaluation systems. Also, Participant 4, who was more negative than positive in the Likert-scale data —shown in her agreement with statements about trust in the RWT and AWE tools and the RWT feedback or experience meeting her expectations—indicated only positive *appreciation* of trust in the RWT in the qualitative data. Participants 8 and 11 were slightly more negative in the Likert-scale survey responding, indicating the RWT feedback and overall experience did not greatly meet their expectations, but because these learners did not convey *appreciation* resources in the open-ended survey responses or stimulated recalls, it was not possible to triangulate their responses across evaluation measures.

Merging the quantitative and qualitative data, the group of participants as a whole conveyed more negative than positive evaluations of trust in the RWT in the qualitative data than in the quantitative data. More negative than positive *appreciation* was expressed in the systemic functional analysis of learners' open-ended survey responses and stimulated recalls, while participants were more positive (indicated by more agreement markers of "3") in reactions to statements about their trust in the RWT, trust in automated writing evaluation systems, and whether the RWT feedback or RWT experience did or did not meet their expectations. Yet there was much projected positivity also conveyed in terms of participants' optimism that their trust in the RWT would improve if accuracy of the analyzer's feedback could also be improved. This relation of RWT feedback accuracy and trust permeated the qualitative data and, while most often was alluded to through participants' use of negative *appreciation* resources when discussing trust in the tool, also surfaced in their discussions of the future potential of the RWT.

The conveyed hopefulness about the RWT feedback accuracy being improved could potentially help to explain learners' Likert-scale responses indicating a decent degree of trust in the RWT. Potentially, because these learners recognized the RWT was still in a nascent stage and that the feedback accuracy could be improved, their optimism about having trust in the RWT in the future impacted their positive Likert-scale survey responses to having trust in the tool. The projected positivity and participants' optimism that their trust in the RWT would improve as the analyzer's feedback is improved emanated through the data sources; this can be perceived as a positive finding that points to participants' hopefulness and anticipation about an advanced version of the RWT that produces more accurate and reliable feedback on their research article section drafts.

The increase in negative evaluations of trust in the RWT in the qualitative analyses (both *appreciation* and *affect*) may have resulted from learners feeling more liberty to openly discuss issues of trust in tool in their stimulated recalls. The triangulation of the results revealed learners' cautiousness in completely trusting the RWT and feedback accuracy as a key source learners' diminished trust in the AWE tool. Feedback accuracy aside, Chang and Tung (2008) and Davis et al. (1989) declare the degree to which CALL program users' accept and have confidence in a technology is truly what determines learners' perceptions of the tool's value.

The presence of negative *appreciation* may also shed light on why some participants disagreed that the RWT feedback met their expectations. The connections learners made between inaccurate RWT feedback and distrust were made by some of the same participants who marked less trust in the RWT as well as less agreement with the statement that the RWT feedback met their expectations. Participants 4 and 7, for example, both associated the analyzer's inaccurate feedback with declarations of trust or mistrust in the RWT. Participant 7 remarked on "the issues [-*appreciation*] with the analysis" and claimed "I would trust it [proj. +*appreciation*] more later" when accuracy of the feedback is improved. Participant 4 also remarked that she "didn't quite agree with [-*appreciation*] the analysis." Both of these participants were among the few who did not agree the RWT feedback met their expectations. Thus it is plausible that these learners were recalling the incorrect feedback given by the RWT analyzer when deciding whether the feedback did or did not meet their expectations.

The determination of learner trust in automated systems is imperative because trust has been shown to impact the effective use, misuse, and even disuse of AWE programs.

Regardless of the reliability, accuracy, or robustness of the system, low trust in an automated system has been linked to the termination of use of the program; by contrast, extreme trust in an automated system has the potential to promote technology users' blind following of a system's instructions or prompts (Parasuraman, 2009). Either of these extreme degrees of trust in an AWE tool is problematic in that each holds the capacity to make learners complacent in their unquestioning acceptance of the system's guidance, encourage users' failure to critically evaluate the system's output, or stimulate complete disregard for the tool's proposed directives. In the context of this study, this means that participants' trust plays a significant role in how they access, interpret, and apply the RWT feedback in their draft revisions.

However, in building learner trust in an automated system like the RWT, it is critical that appropriate, not greater, trust is cultivated. Past research has acknowledged that technology users tend to trust automated systems in similar ways as they trust humans (Fogg, 2003; Reeves & Nass, 1996), and comparable to human–human interactions, trust developed in human–computer interactions encompasses complex variables, including users' workloads, efforts to interact, recognized opportunities and risks, and individuals' self-assurance (Lee & See, 2004). Lee and See argue that developing learners' appropriate reliance on automated systems necessitates: demonstrating the capabilities of the automated system, disclosing how the computation functions to produce the results, outlining the purpose of the system and how it relates to users' end goals, showing how system performance is impacted by contextual variables, and articulating the reliability of automated output. Lee and See's suggestions should encourage instructors using the RWT to build graduate students' research writing skills by integrating more comprehensive pre-task training; such a practice will likely help to scaffold learners' in-class use of the RWT for research article draft revision.

In summary, this triangulation of data has revealed that as a group, learners were more negative in their use of *appreciation* resources to discuss trust in the RWT, while they were more positive in their agreement with statements about trust in the RWT and automated systems and responses about the RWT experience and RWT feedback meeting their expectations. Though individual learner responses were not entirely consistent across qualitative and quantitative data analyses, the triangulation did surface differing results in participants' responses about their RWT experience versus RWT feedback, with learners indicating more positive reactions to the RWT experience than to the RWT feedback. A notion from the qualitative data about inaccurate feedback being a source of distrust in the RWT may possibly help us understand learners' reactions to the RWT feedback in terms of their expectations that the feedback on their analyzed section draft should reflect their intended rhetorical meaning.

Section 4.3. RQ1c- Learner Control of the RWT

Quantitative and qualitative data analyses were used to answer RQ1c — *What degree of control do learners perceive they have when using the RWT?* As in the previous sections of this chapter, quantitative then qualitative results will be presented, followed by the results of the data triangulation.

Executive Summary

Findings from analyses accomplished to answer RQ1c on perceptions of learner control when interacting with the RWT showed that participants perceived the RWT as limiting certain aspects of their draft revision and allotting them freedom to control other elements of their revisions. A descriptive statistical analysis of responses on the Likert-scale questions in the post-task survey showed much variation among participants in their agreement with statements about the degree of control they felt they had interacting with the RWT. While most participants agreed that they had the ability to accept or reject the RWT's recommended revisions, others disagreed. Variation among the class also surfaced in how participants perceived the RWT as restricting the amount of control they had in the draft revision process, with a wide span of agreement and disagreement with this survey statement.

An analysis of the *appreciation* resources learners used in evaluating the degree of control they felt they had when interacting with the RWT demonstrated an equal amount of positively and negatively charged judgments. One emergent theme in learners' discussions of control targeted the capacity students felt they had or did not have to perform certain functions with the RWT, with direct references to the desire to "be able" to accomplish specific draft revision tasks using the tool. Another theme from the *appreciation* analysis centered on the RWT's system allowances or restrictions; the verb "allow" was used frequently to discuss what the learners perceived as being permitted to accomplish, and even a reference to "freedom" was made in a description of perceived learner control. Yet another theme regarded what students perceived the RWT as forcing them to accomplish; this negative *appreciation* was revealed in the use of such lexicogrammar as "had to" or "should" pertaining to what revisions the learners felt the RWT was requiring them to enact.

Findings from the analysis of *graduation* resources used to scale learners' *appreciation* of their control over the RWT showed more low- and medium-scaled resources over high-scaled resources, implying learners were more hesitant to convey strong evaluative judgments of learner control. Interestingly, most medium-scaled *graduation* resources used were positively charged, while most of the low-scaled *graduation* resources used were negatively charged. This distinction could point to participants' inclination to commit more strongly to positive evaluations of learner control, and more tentatively to negative *appreciation* of perceived control.

In summary, findings from analyses of RQ1c reveal participants' recognition of both the abilities they had to revise their drafts with the RWT as well as the restrictions the AWE program placed on them during their draft revision. A comprehensive report and discussion of findings from the quantitative and qualitative data analyses are offered in the following subsection.

Quantitative Analysis for RQ1c

In response to the Likert-scale items on the perceived degree of control learners felt they had when using the RWT, there was a wide amount of variability in the individual students' responses. Table 4.3-1 presents the descriptive statistics for the post-task survey items concerning learners' ability to control their draft revision process with the RWT.

Table 4.3-1

Descriptive Statistics for Likert-Scale Items on Trust in the RWT

Post-Task Survey Item	Mean	Median	St. Dev
I had the ability to accept or reject the revisions recommended by the RWT.	3	3	0.63
The RWT tool did not restrict the degree of control I had during my interaction.	3	2.54	0.82
I felt like I had control over the revision process when using the RWT tool.	3	2.54	1.04

Note . N= 11. All response scores based on a Likert-scale where 1= strongly disagree and 4= strongly agree.

Compared to responses to statements relating to RQ1a and RQ1b, learner responses to assertions about perceived control during the RWT process showed greater variation among members of the class. This variation is evident in the higher Standard Deviation values, ranging from 0.63 to 1.04, in the array of 11 respondents. This variation becomes clearer when dissecting the learner responses to each of the post-task survey items for RQ1c.

With the exception of two participants (P3 and P7) who disagreed with the statement, nine of 11 participants agreed or strongly agreed that they had the ability to accept or reject the RWT's recommended revisions. However, there was more variability in response to the statement about the RWT's restriction of the degree of control learners had during their draft revision. Participant 7 strongly felt the tool restricted her control, and four other participants agreed their control was restricted. Participant 10 strongly agreed the RWT allowed him control over his draft revision, and the five remaining participants also agreed. The most variation (as evidenced in a Standard Deviation value of 1.04) in learner perceptions of control over the RWT appeared in the final statement related to RQ1c. In response to the post-task survey item "I felt like I had control over the revision process when using the RWT tool," two participants (P4 and P7) strongly disagreed, three disagreed, four agreed, and two (P8 and P10) strongly agreed. This spread reflects a wide variation in learner perceptions about the degree of control they felt during the draft revision.

This and other examinations of control users have during human–computer interactions are incredibly important when evaluating users' interactions with any computer-based application, but become particularly integral in considering instructional contexts. As Heift (2002) defines, learner control is the extent of control students may exercise in a learning situation, potentially involving students' choice of what system features to access, interact with, or bypass altogether (Heift, 2007). Understanding language learners' perceptions of their opportunities to explore and exploit CALL applications provides software developers and designers a better sense of the degree of choice learners perceive in their computer-assisted learning process.

As was shown in this analysis, most participants in this dissertation study agreed they had the ability to accept or reject the RWT's recommendations for draft revision. This perceived freedom may suggest that the participants did not feel pressure to adhere to the RWT's suggested revisions when revising their drafts. When learners feel they have a greater amount of freedom in how they are able to interact with a program, learner autonomy is enhanced. As Nix and Wylie (2011) found, students respond positively to computer-based tools when the learners hold the capacity to self-regulate their learning experience. Additionally, behavior, motivation, and cognition are connected to students' ability to control their own pace for accessing feedback when they need it most (Heift, 2002). That the RWT users were able to manage their intake of feedback, in written and visual form, and make revisions to their texts on their own terms may have stimulated a readiness to use the tool in the future.

Yet as some scholars in AWE research (Cotos, 2011; Levy & Stockwell, 2006; Wang & Xian, 2011) have observed, not only the application but also the type of tasks learners engage in to revise drafts with AWE software impacts the degree of learner autonomy perceived. Allowing language learners a variety of ways to interact with a program as they make changes to their writing will not only boost their autonomous learning, but also motivate future interactions with the CALL program for performing draft revisions (Cotos, 2011; Wang & Xian, 2011). The RWT's provision of multiple sources and forms of feedback, such as the sentence-level color-coded format, Step-specific labels, and range bars showing goals for incorporating Moves, to name a few, allot varied ways for RWT users to consume and interact with the system's individualized feedback on their drafts, thereby encouraging learners' independence in their draft revision with the AWE system.

There was, however, still variation in the degree to which learners agreed with statements about the control they felt they had when revising their drafts with the RWT. The variation may be, in part, due to the nature of the feedback RWT users received in the Analysis Module and potential constrictions they felt in how they could interpret or apply that feedback. As Grimes and Warschauer (2006) and Yang (2004) assert, AWE feedback has the tendency to be quite formulaic and sometimes can be perceived as fixed or mechanical by AWE program users. It is possible that, if some participants in this study perceived the RWT feedback to be formulaic or not individualized enough for them to help develop their academic writing skills, it could have negatively impacted their agreement with the statement about how much control they felt in their RWT interaction.

In summary, the variation in Likert-scale responses gauging learners' perceptions of the degree of control felt when interacting with the RWT suggests each participant had a unique reaction to or experience with the tool; the RWT apparently provided some students the ability to accept or reject changes where appropriate, while in other cases it restricted the revision process and amount of control over that process. Possible cases for the variation in participants' perceptions of the degree of control they felt during their RWT interactions are explored in the discussion of results for the combined quantitative and qualitative *appreciation* analysis for RQ1c.

Appreciation **(Quantitative +Qualitative) Analysis for RQ1c**

Qualitative analyses of the *appreciation* resources participants used in their open-ended survey responses and stimulated recalls in discussing perceived control over the RWT showed that learners' expressions about their perceived control when using the AWE program were almost as equally positive as they were negative. Table 4.3-2 displays the tallies of *appreciation* resources used by each participant, and is categorized by the charge of the resource. Similar to the analysis conducted in answering RQ1b on learners' trust in the RWT, the *appreciation* resources used in the open-ended survey responses and stimulated recalls were totaled per participant and the analyses were combined, as relatively few *appreciation* resources were used in all.

Table 4.3-2

Frequency Count for Appreciation Resources in Open-Ended Survey Responses and Stimulated Recalls

Participant	Positive	Projected Positive	Negative	Projected Negative	Neutral	*Appreciation* Resource Total
P1	8	0	4	0	0	12
P2	2	0	5	1	0	8
P3	3	1	3	0	0	7
P4	1	5	18	0	1	25
P5	9	1	3	0	0	13
P6	10	7	15	0	0	32
P7	0	0	1	0	0	1
P8	0	0	0	0	0	0
P9	4	1	4	0	0	9
P10	6	0	3	0	0	9
P11	0	0	0	0	0	0
TOTAL	43	15	56	1	1	116

What Table 4.3-2 shows is that, when discussing the "trigger" — the degree of control felt when interacting with the RWT — participants overall used an equal number of positive and negative *appreciation* resources. Of the total 116 *appreciation* resources used, 57 (49%) were used to convey negative or a projected negative evaluation in learners' expressions of how much control they felt they had while using the RWT, while 58 (50%) of the resources were positive or projected positive and 1 (1%) was neutral.

Participants varied greatly in how they discussed their perceived control in the RWT draft revision, as revealed by the *appreciation* resource analysis. From the qualitative data sources, two participants (P8 and P11) did not evaluate the control they felt they had while using the RWT, and five participants (P2, P3, P7, P9, and P10) used fewer than 10 *appreciation* resources. Two other learners stood out in their extensive evaluation of the control they perceived they had when using the RWT. Participants 4 and 6 used 25 and 32 *appreciation* resources, respectively, though the charges of these resources varied. While Participant 4 used 18 negative *appreciation* resources and only six positive resources, Participant 6 used an almost equal number of positive and negative resources (17 positive and 15 negative). Others were either more positive (P1, P5, and P10), more negative (P2), or relatively equal (P3, P7, and P9) in their appraisal of their perceived degree of control in their RWT interactions.

Themes in the use of *appreciation* resources for discussing learner control over the tool revolved around direct references to control or a lack thereof, the [in]ability the students were allotted in performing certain functions in the RWT, system allowances or restrictions, and what students perceived the RWT as forcing them to accomplish. Some participants made explicit references to the control they felt they had while revising their drafts with the RWT, though the reactions were varied. When asked specifically what amount of control she felt she had during the RWT interaction, Participant 4 remarked “I think limited [-*appreciation*];” Participant 9 echoed this response, noting “I had a limited [-*appreciation*] degree of control” when interacting with the tool. Participant 1 was more precise in her division of which features of the RWT offered her more or less control. “In the first stage, when I was reading the comments, this is where you had the least control [-*appreciation*],” she stated in her stimulated recall, “but this editing, I had the most control [+*appreciation*] here,” she recalled immediately after. At times, participants’ references to perceived control were more implicit. Participant 6, for example, asserted “It would do what I told it to do [+*appreciation*],” implying she had the power to control what the system was doing for her.

Appreciation of perceived control students felt when working with the RWT was also expressed in reference to participants’ abilities or inabilities they felt they had when interacting with the program. In fact, the word (or derivation of the word) “able” was explicitly articulated frequently in participants’ denotations of learner control. Participant 6 remarked that “The ability to split the sentence into multiple moves would be ideal [proj. +*appreciation*],” while Participant 3, when asked what he suggested would be an improvement to RWT, suggested it would be good “If I were able [proj. +*appreciation*] to do synchronized edits.” Notice how in both of these examples connecting ability to learner control over the RWT interaction, participants conveyed projected positive *appreciation*, signifying hopefulness as associated with future abilities they would be given if the tool were developed and improved further.

Abilities and inabilities that participants felt were tied to issues of control over their RWT interactions were also communicated using the auxiliary verb “can.” Participant 10 mentioned capabilities he considered having in his RWT interaction, uttering “I can [+*appreciation*] quickly skim my draft” and “I can [+*appreciation*] check the color” as he perused the RWT Analysis Module’s feedback on his written draft. The same participant, later in his stimulated recall, commented that “From the color on the analyzed part, I can see

[+*appreciation*] if it agrees with my thought," indicating he was comparing the color-coded text provided in the RWT Analysis Module to his intended rhetorical meaning in a given sentence. Participant 9 also positively *appreciated* the control she had in her RWT interaction, declaring "I can [+*appreciation*] correspond the example sentence to my reading, writing;" this statement mirrors a similar sentiment expressed by Participant 10, who used the RWT feedback to examine intended rhetorical meaning and/or compare that feedback to exemplary examples of what the author intended to accomplish in his sentence. Allusion to drafts surfaced as another theme connected to what RWT users were or were not able to do; "You can [+*appreciation*] switch between drafts," Participant 9 recalled, highlighting the ability to transition between previous and current drafts as a positive feature she had control of when interacting with the RWT. Participant 6 also emphasized the ability to edit drafts then reanalyze the text as an advantage of her interaction with the tool, stating "I can edit [+*appreciation*] the draft and then it tells me again." Yet another participant (P2) confirmed the ability to edit as a positive aspect of her RWT draft revision, saying "I can [+*appreciation*] make modifications using RWT."

Resources for conveying *appreciation* with regards to learners' control over the tool were also used when referring to the allowances provided or restrictions set by the RWT. "The analytic part allows me (+*appreciation*) to compare with the comments," Participant 2 stated, explaining a provision of the Analysis Module. Participant 3 also used the verb "allow" when speaking of the liberty he felt the RWT allotted to him in revisions, saying "The use of draft allows me to effectively undo changes." This freedom participants felt they had in their RWT draft revision was always *appreciated* positively; for example, Participant 1 described how she felt more "freedom" when she had begun to give thumbs up or thumbs down to the sentences she agreed or disagreed with, respectively, stating "After I started this liking, this is more freedom [+*appreciation*]."

Some participants directly referenced the opportunities the RWT gave them when positively *appreciating* their control during use of the tool. "The RWT gave me many opportunities [+*appreciation*] for interaction," Participant 10 proclaimed. Participant 1 asserted, "It's giving me a chance [+*appreciation*] to change what I had and then to give new feedback." The learner autonomy during interaction was affirmed by Participant 5 who said "I didn't feel it limited [+*appreciation*] me." This allowance for self-directed and autonomous interaction with the tool was a commonly cited positive attribute of the RWT.

Just as learners' positive *appreciation* in terms of learner control over the RWT was associated with what the tool allowed, negative *appreciation* was connected to how the RWT restricted learner control in students' draft revisions. "I could never get it to see [-*appreciation*] what I wanted it to," Participant 6 complained when describing how her edits made little difference in the RWT Analysis Module feedback. Participant 7 had a similar criticism of the RWT, stating "there was no way [-*appreciation*] to state things" so the analyzer would recognize her intended rhetorical function. This same participant also felt the analyzer's limitations inhibited her exhaustive exploitation of the tool, claiming "I wasn't able to use it to its full extent or as effectively." Participant 4 believed there should have been more opportunities to interact with the visual feedback, which came through in her statement "When you analyze with the pie chart, there's nothing to do [-*appreciation*] about it." The same user later complained that "you only [-*appreciation*] submit the drafts," feeling she should have been given more opportunities to engage with the RWT analyzer aside from draft submission.

Negative *appreciation* of learner control over the AWE program was similarly linked to what learners perceived the RWT as forcing them to do. Commonly used language conveying learners sense of feeling obliged to do something came across through the use of modals, such as “had to” or “should,” and verbal phrases such as “made me.” “I had to [-*appreciation*] remove the periods,” Participant 3 explained when describing how the RWT analyzer would not detect the function of a sentence unless certain punctuation was removed. “So later I should [-*appreciation*] go back to the work file,” Participant 10 remarked in remembering how he had to switch between drafts to make final edits, because he did not think RWT would allow him to save what he had revised in the program. Participant 6 had a similar complaint about the lack of control she felt when editing, stating that after editing “I had to [-*appreciation*] go through and see what all the changes I made are,” later pointing out that the ability to track or highlight edits in drafts would alleviate having to manually compare drafts side-by-side to search for changed sections.

From the equal number of positive and negative *appreciation* resources used in the qualitative data, it seems learners were divided in their evaluations of the [in]ability they felt they were allotted in performing certain functions in the RWT. However, the notion of learner control is multi-faceted and learners may have had various interpretations of the question about how much control they felt with the tool during the draft revisions. As Heift (2007) maintains, learner control encompasses a number of aspects from the selection of what program features to interact with to the order in which features are accessed. Study participants also may have interpreted questions about control as pertaining to a sense of empowerment they felt in having the ability to self-regulate their draft revisions using the RWT (Cotos, 2011; Nix & Wylie, 2011). Thus variations in learners’ interpretations of what learner control signified may have influenced their responses to questions about the control they felt they had in the RWT interaction.

Participants' negative *appreciation* of the control they felt they had in RWT draft revision was seemingly associated with restrictions they felt during their RWT interaction. Learners expressing they "could not" or that there was "no way to" accomplish a goal using the RWT represented constraints they felt the RWT was placing on them as they revised their drafts. Additionally, learners perceiving that they "had to" or "should" interact with the RWT in specific ways suggests that participants perceived obligations to use the RWT using a narrow range of approaches. The expressed desire for enhanced opportunities for receiving feedback or engaging with the analyzer and learners' projections about how much their control would be enhanced if the RWT functional capacities were improved implies that some interactional decisions felt forced and outside the learners' control. Impressions that a program is restricting how users exploit the tool use is detrimental in CALL contexts, as the limitations are recognized as impeding autonomous learning (Heift, 2002). As Beatty (2003) warns, some CALL programs' restricted range and regimented sequencing of activities and features limit users' chances to shape their learning process to fit their individual needs. Therefore, RWT users' mention of the restrictions during draft revision could be seen as inhibiting their ability to tailor their learning of the research article genre using the RWT.

Conversely, positive *appreciation*, appearing in learners' assertions about the allowances the RWT afforded during draft revision, can be connected to provisions for learner autonomy. Specifying that the AWE tool "allowed" them interactional opportunities exemplifies the freedom for the technology users to engage with the AWE program as they wished: in other words, to self-direct their learning process (Nix & Wylie, 2011). Little

(1996) contends that technology can facilitate the growth of learner autonomy to the degree that it can "stimulate, mediate, and extend the range and scope of the social and psychological interaction on which all learning depends" (p. 203). RWT users' citing the allowances of the AWE program through positive *appreciation* points to their perceived abilities to self-regulate their genre learning with the RWT.

In addition to enhancing learner autonomy, user perceptions of control are strongly connected to technology users' self-efficacy or their confidence in their ability to perform tasks using the computer-based application (Bandura, 1986;Compeau & Higgins, 1995; Kinzie, Delcourt, & Powers, 1994); it has been documented that technology users' felt self-efficacy impacts how well they are able to accomplish a task, sustain the use of a technological tool, and revisit the program in the future (Compeau & Higgins, 1995; Kinzie et al., 1994). Preparatory presentations which illustrate proper and effective use of a computer-based program are key to building self-efficacy, as they enhance learners' familiarity with the technology, thus boosting their comfort levels when performing tasks with the computer-based tool (Hong, 2002; Sam, Othman, & Nordin, 2005; Shaw & Giacquinta, 2000). Because self-efficacy could impact language learners' use of the RWT, instructor demonstrations outlining how to best use the AWE program for revising drafts may serve to promote successful use of the RWT in improving learners' understanding and application of genre conventions.

In summary, participants tended to *appreciate* their control over the RWT in a positive way when referencing the freedom they had during interactions with the tool. Conversely, restrictions the RWT imposed or inabilities to utilize the tool in ways they wanted prompted negative evaluations in discussions of control over the RWT.

As with RQ1b, a crucial component in answering RQ1c was the *graduation* analysis, which examined how participants scaled their *appreciated* statements about the degree of control they felt when using the RWT. Table 4.3-3 shows a frequency count for the individual participant usage and overall use of *graduation* resources used for *appreciation* in learners' responses on the open-ended survey.

Table 4.3-3

Frequency Count for Graduation of Appreciation *in Open-Ended Survey Responses and Stimulated Recalls*

Participant	Positive	Projected Positive	Negative	Projected Negative
P1	3	0	2	0
P2	0	0	4	0
P3	0	0	0	0
P4	0	2	8	0
P5	0	0	0	0
P6	4	3	8	1
P7	0	0	1	0
P8	0	0	0	0
P9	0	0	0	0
P10	3	0	0	0
P11	0	0	0	0
TOTAL	10	5	23	1

As Table 4.3-3 shows, more resources were used to *graduate* negative *appreciation* in stimulated recall or open-ended survey response discussions of learner control over the RWT than to *graduate* positive *appreciation*. Of the 39 total *graduation* resources used to scale learners' *appreciation* of learner control over the RWT, 24 (62%) were negatively charged, while 15 (38%) were positively charged. Also clear from the table is that the participants who evaluated the control they experienced when working with the RWT (P4 and P6) used more resources to *graduate* their *appreciation* than other students. Of the 10 *graduation* resources used by Participant 4, eight (80%) were used for negatively *appreciating* learner control during her RWT interaction, while 56% (nine of 16) of the *graduation* resources used by Participant 6 were negative. These participants' slightly increased use of *graduation* resources to convey negative over positive *appreciation* of their control over the RWT parallels the overall group trend to *graduate* negative *appreciation* more than positive *appreciation*.

The force of those *graduation* resources participants used to discuss their control over the AWE system was also analyzed by grade (low, medium, or high) to determine the degree of RWT users' felt control when interacting with the tool for draft revision. Table 4.3-4 displays a summarized overall tally of participants' *graduation* resources used in response to questions geared to answer RQ1c, and is categorized by positive or negative charge.

Table 4.3-4

Graduation Resource Rank by Appreciation Charge in Open-Ended Survey Responses and Stimulated Recalls

Appreciation Charge	Low	Med.	High
Positive	4	11	0
Negative	14	7	3
TOTAL	18	18	3

From Table 4.3-4 it can be observed that an equal number of low and medium *graduation* resources were used in participants' discussions of the control they felt when interacting with the RWT. Of the 39 total *graduation* resources used, low- and medium-grade resources each accounted for 46% (18 of 39) of the total number, while only three high-grade resources (8% of the total number) were used. Interestingly, most (61%, or 11) of the 18 medium-scaled *graduation* resources used were positively charged, while most (78%, or 14) of the 18 low-scaled *graduation* resources used were negatively charged. Furthermore, all high-scaled *graduation* resources used were employed to convey negative *appreciation* of learners' felt control over the RWT.

The scaled *graduation* resources participants used in discussing the control they felt they had in their RWT draft revisions were comparable to those learners used to scale their *appreciation* of the usefulness of the RWT (in answering RQ1a) and trust in the RWT (in response to RQ1b). Typical *graduation* resources used to scale *appreciation* to a low grade were "still," "just," and "only." Participant 4 recalled, "I'm still [low *graduation*] trying to figure out [-*appreciation*] the differences," negatively *appreciating* how she continues (at the time of the stimulated recall) to decipher differences between the RWT feedback and her own understanding of the rhetorical functions of her sentences. Participant 4 also commented on her limited capabilities in interacting with the system, stating "We just [low *graduation*] analyze, edit, look at this [-*appreciation*];" Participant 6 also negatively *appreciated* her limited degree of control over the RWT Analysis Module, stating "I couldn't [-*appreciation*] just [low *graduation*] click Analyze." A negative evaluation of her control over the RWT was also evident in Participant 1's response, "You only [low *graduation*] read what the system gives you [-*appreciation*]," conveying the user's limited ability to interact further with feedback from the RWT aside from simply reading it. Frequently used medium-scaled *graduation* resources were the adjectives "really," "more," and "a lot of" and the adverb "maybe." "I cannot [-*appreciation*] really [medium *graduation*] see this step should look like this" Participant 4 stated, communicating confusion about what the RWT analyzer's feedback enabled her to understand in terms of the anticipated function of the sentence. Participant 10 used a medium-scaled *graduation* resource to rank his positive *appreciation* of control he felt during the RWT draft revision, claiming "The RWT gave me a lot of [medium *graduation*] opportunities [+*appreciation*] for interaction." Also, Participant 4 indicated that the RWT propelled her to re-examine her draft, saying "Maybe [medium *graduation*] I should spend more time [proj. +*appreciation*] on that." Finally, high-scaled *graduation* was conveyed through adverbs of extremes, such as "never," as in "I could never [high *graduation*] get it to see what I wanted it to" (P6), or "way too," as in "We had way too [high *graduation*] short [-*appreciation*] of time to go through the analysis" (P6). Both of these uses of high-graded adverbs for scaling negative *appreciation* of learner control derived from Participant 6's stimulated recall, one which contained more negative than positive *appreciation* of the user's control over the AWE program.

That more *graduation* resources were used for negative *appreciation* of the RWT shows participants' inclinations to both soften and intensify their evaluations of the degree of the control they felt when interacting with the tool. The greater number of low-ranked *graduation* resources used for negative *appreciation* of learners' control over the RWT perhaps reflects participants' tentativeness in expressing a straightforward negative evaluation of the tool, while the use of more medium-scaled resources for positive evaluations may suggest more openness in learners' *appreciation* of their control during their RWT interactions. Interestingly, the only high-scaled *graduation* resources were used with negative *appreciation* of learner control in their RWT experience. This use of high-ranked *graduation* for negative evaluations may reflect learners feeling intensely about their negative experience in discussing control in their RWT interactions, potentially a result of feeling they "had to" perform certain tasks in their draft revision.

To summarize, the *appreciation* analysis and accompanying *graduation* analysis conducted to answer RQ1c showed that participants positively discussed learner control in terms of liberties, abilities, and autonomy afforded to them by the RWT program, and negatively *appreciated* the tool in terms of restrictions or lack of capabilities they had during the draft revisions. The greater number of low-ranked *graduation* resources used for negative *appreciation* of learners' control over the RWT perhaps reflects participants' tentativeness in expressing a straightforward negative evaluation of the tool, while the use of more medium-scaled resources may suggest more openness in learners' *appreciation* of their control during their RWT interactions.

Triangulation of Quantitative and Qualitative Results

Results of the triangulation of quantitative and qualitative data relating to learner control in RWT interactions show that individual learners' perceptions were relatively consistent across both qualitative and quantitative data sets. Specifically, the comparison of data sources revealed that students who tended to indicate stronger agreement with post-task survey Likert-scale statements about experiencing the ability to control their RWT draft revision process also used more positive *appreciation* resources in their stimulated recalls and open-ended post-task survey responses. Similarly, those participants who were more negative in their *appreciation* of the degree of control they felt when interacting with the RWT disagreed more with Likert-scale statements about the control they felt in their interactions with the AWE program.

A comparison of *appreciation* resources used by participants in the open-ended survey and the stimulated recalls was conducted to triangulate learners' perceptions of the degree of control they felt while using the RWT. Figure 4.3-1 provides a visual illustration of the positive versus negative charges of *appreciation* resources learners used to discuss how much control they felt they had while analyzing their drafts using the RWT. The figure provides a breakdown of the percentages of each charge (positive and negative) of *appreciation* resource used by participants in both open-ended survey responses and stimulated recalls. As can be seen from the figure, both charges are primarily equal. Positively charged *appreciation* (including positive and projected positive *appreciation*) constitutes 50.4% (or 58 of 115 total) of the charged *appreciation* expressed, while negatively charged *appreciation* (including negative and projected negative *appreciation*) constitutes 49.6% (57 of 115 total) of the overall charged *appreciation.*

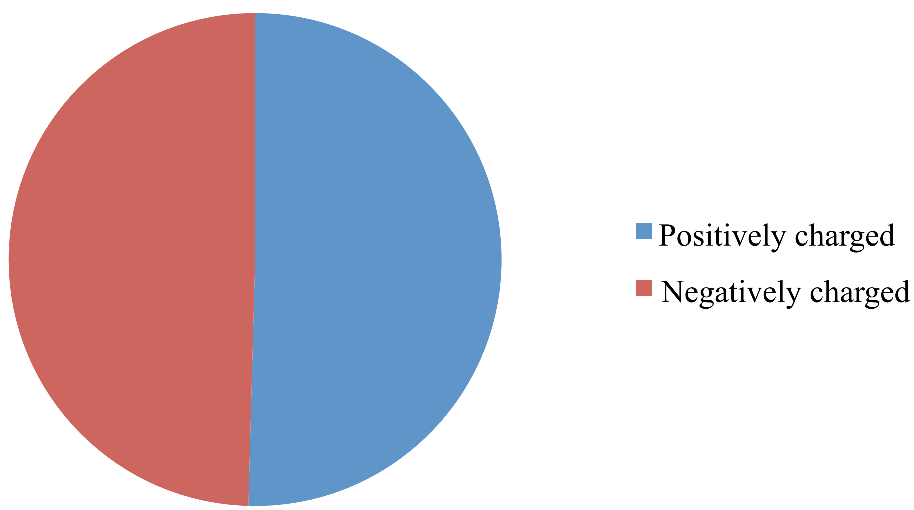


Figure 4.3-1. Distribution of *appreciation* resource charges in open-ended survey responses and stimulated recalls

Results from this visual comparison of the positively and negatively charged *appreciation* resources used in the open-ended survey responses and stimulated recalls regarding RQ1c show that participants expressed an equal amount of positive and negative *appreciation* when discussing control over the RWT. While Figure 4.3-1 illustrates the group totals for the charged *appreciation*, Figure 4.3-2 provides a visual display of the individual participants' use of positively or negatively charged *appreciation* resources.

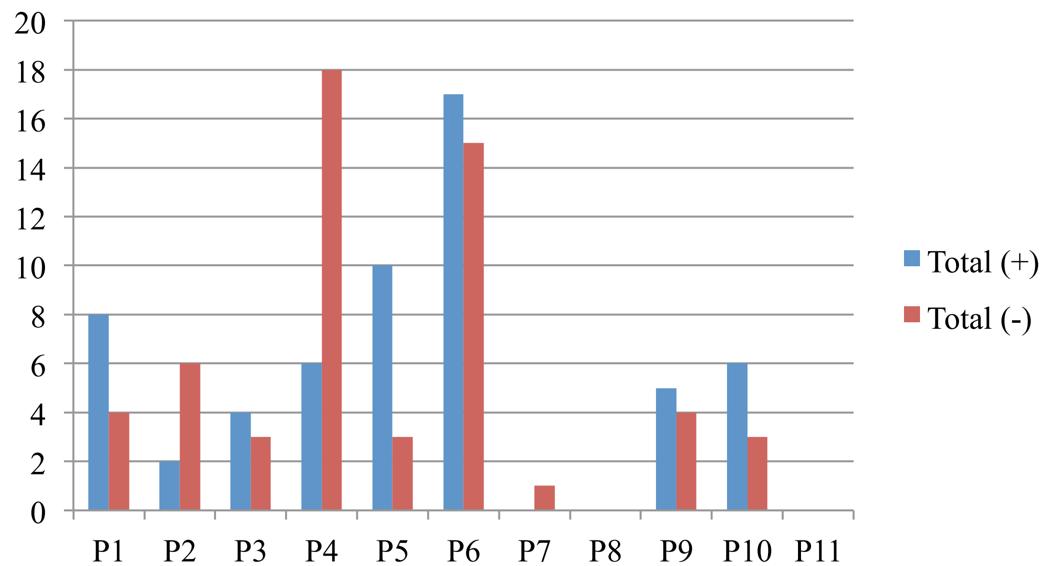


Figure 4.3-2. Total of positive and negative *appreciation* resources used by participant (P=participant) in open-ended surveys and stimulated recalls

A glimpse at Figure 4.3-2 reveals more distinctive trends in individual students' *appreciation* of their control of the RWT in terms of positive or negative evaluations. From an examination of the visual, it is clear that two participants (P4 and P6) dominated the numbers of *appreciation* resources when discussing their perceived degree of control over the RWT. What is also clear from Figure 4.3-2 is that only three participants (P2, P4, and P7) evaluated their control of the RWT more negatively than positively, while six participants (P1, P3, P5, P9 and P10) conveyed more positive than negative *appreciation*. Two participants (P8 and P11) did not discuss their perceived control over the RWT whatsoever.

What could be discerned from this graphic is how one participant's (P4's) overwhelming use of negative *appreciation* resources may have skewed the total count of negative *appreciation* resources. As a whole, more learners discussed their control of the RWT in positive, rather than negative, ways. In the cases of Participants 1 and 5, positive evaluation of their control over the RWT was substantially more than their negative evaluations. In other words, more participants expressed positivity than negativity in their discussions of user control over the RWT tool.

By comparing these positively and negatively charged *appreciation* resource summaries to the Likert-scale post-task survey responses we witness that the positively charged evaluations may be obscured by a few participants' strong negative evaluations of their perceived control during their RWT draft revisions, with more positive evaluation being conveyed on the whole by individual participants. Table 4.3-5 below shows individual participants' responses to Likert-scale survey items gauging learners' perceived control they felt while interacting with the RWT. As in the previous reports of results pertaining to RQ1a-b, descriptive statistics in the chart are provided based on a scale from 1 to 4 with "4" indicating the strongest agreement with the accompanying statement.

Table 4.3-5

Participant Responses to Likert-Scale Post-Task Survey Questions Concerning the Degree of Control Learners Felt When Using the RWT

Likert-Scale Survey Response Item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
I had the ability to accept or reject the revisions recommended by the RWT.	4	3	2	3	3	3	2	4	3	3	3
The RWT tool did not restrict the degree of control I had during my interaction.	3	3	2	2	3	2	1	3	3	4	2
I felt like I had control over the revision process when using the RWT tool.	3	3	2	1	3	2	1	4	3	4	2

Note: All response scores based on a Likert-scale where 1= strongly disagree and 4= strongly agree.

Figure 4.3-3 displays a visual depiction of participants' agreement with statements on the Likert-scale items in the post-task survey gauging their perceptions on the freedoms or restrictions allotted to them when interacting with the RWT. Along the y axis are displayed the Likert-scale rankings from 1 to 4 (“1” signaling strong disagreement with the statement and “4” signaling learners’ strong agreement with the statement.)

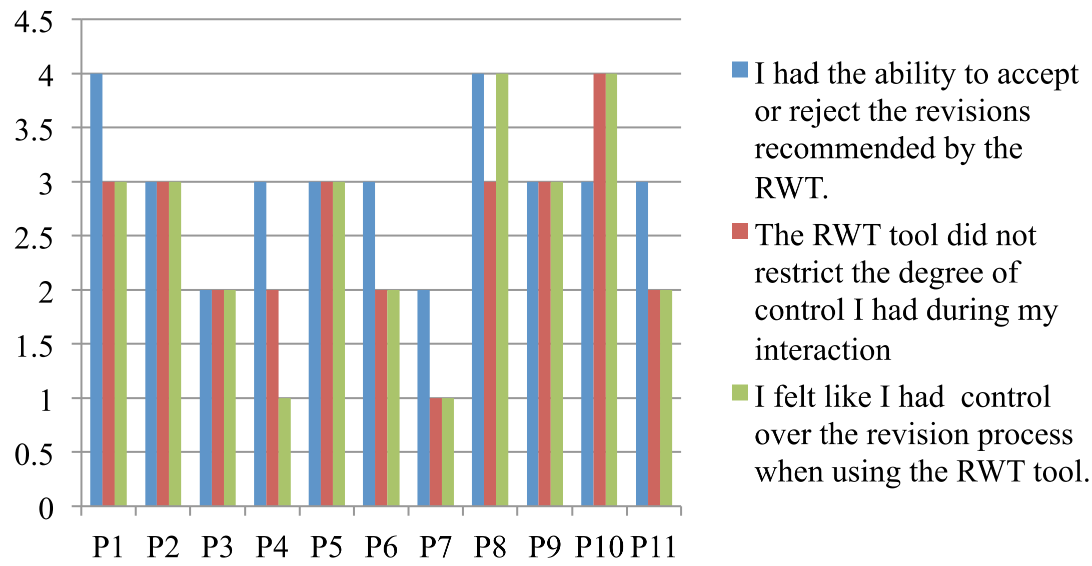


Figure 4.3-3. Participants’ responses to Likert-scale items on post-task survey about learner trust in the RWT *Note:* X axis shows participant indicators; Y axis shows points 1-4 on the 4-point Likert-scale survey where 1=strongly disagree, 4=strongly agree.

Results shown in the table and corresponding figure expose the wide variation in individual learners’ responses to questions about the amount of control they felt they had when interacting with the RWT. In response to the item gauging learners’ responses to the statement on the ability for students to accept or reject revisions recommended by the RWT, no participants marked strong disagreement, and two participants (P1 and P8) marked strong agreement. Most other students agreed with the statement (indicated by their mark of a “3” on the scale). When responding to the statement that the RWT did not restrict learners’ control in their interaction, one student (P7) indicated strong disagreement with the statement, signaling she strongly felt the RWT restricted the amount of control she had during her draft revision. Another student (P10) indicated strong agreement with the statement, signifying he strongly felt that the AWE program did *not* restrict his control of the draft revision process. The remaining students were equally divided in terms of agreement or disagreement that the RWT restricted the amount of control they had during their draft revision. Finally, in response to the last statement about learners feeling like they had control over the draft revision process, two students (P4 and P7) marked strong disagreement, suggesting they did *not* feel like they had control over their RWT draft revision process; Yet two different students (P8 and P10) indicated strong agreement with the statement, meaning they intensely felt they *did* have control over their draft revision process with the RWT. The remaining students were split in terms of their disagreement and agreement that they had control of their draft revisions with RWT.

A side-by-side comparison of learners' Likert-scale survey responses and the findings from the *appreciation* resource analysis may help in revealing obvious patterns in how individual participants tended to positively or negatively evaluate their control of the draft revision process using the RWT. Figure 4.3-4 below provides a back-to-back comparison of the positive and negative *appreciation* resource tally in the qualitative data (in the top graph) and agreement with statements on learner control in participants' Likert-scale responses on the post-task survey (in the bottom graph). In both graphs, the X axis represents the participant identifier (e.g., P1, P2).

What the juxtaposed graphs show is that that those students who were more positive in their *appreciation* of learner control over the RWT in the qualitative data were similarly positive in their Likert-scale survey responses, as suggested by their stronger agreement with statements on learners' abilities for controlling their RWT draft revision. Those participants who were the most positive in the open-ended survey responses and stimulated recalls in

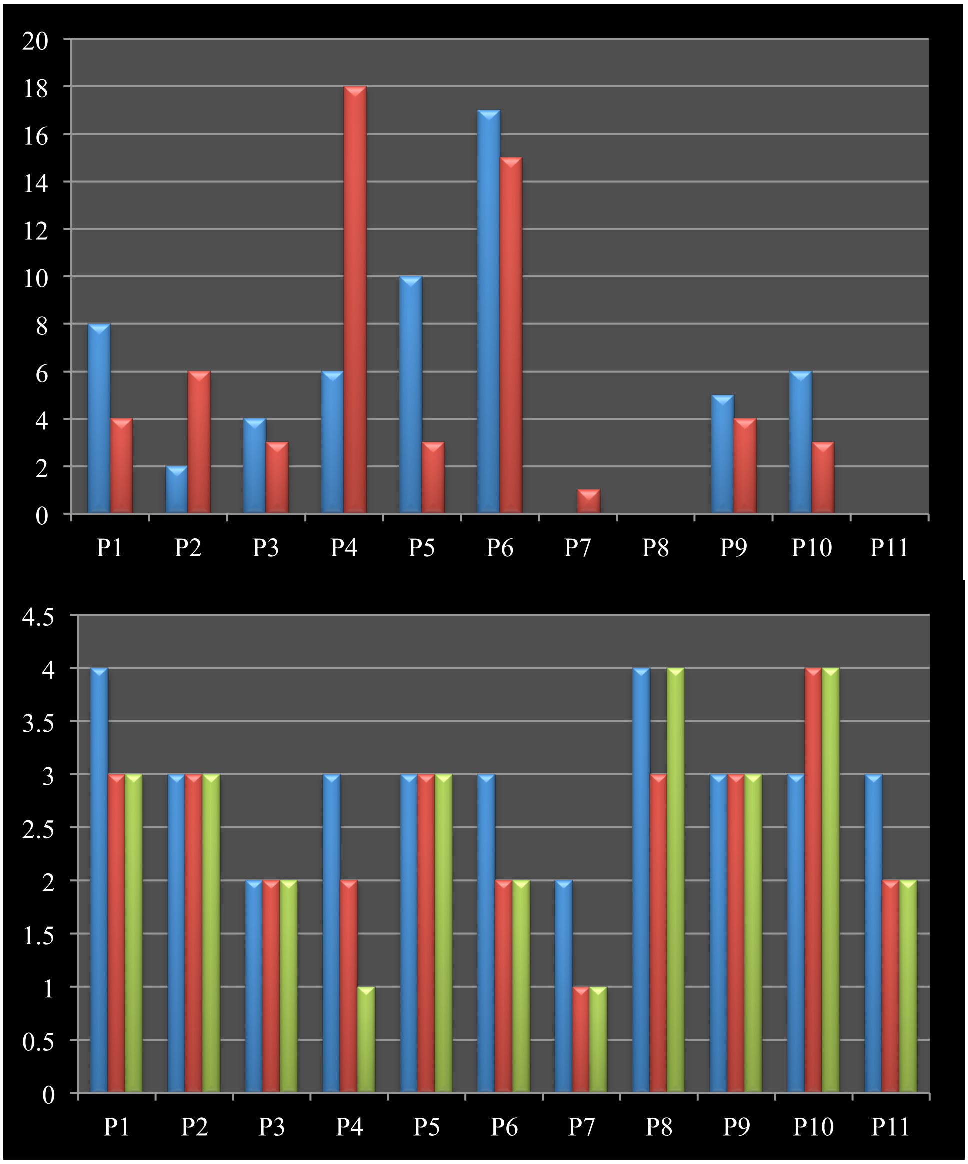


Figure 4.3-4. A within-participant comparison of positive (in blue) and negative (in red) *appreciation* resource use (in top chart) compared to degree of control indicated in Likert-scale statements (in bottom chart)

terms of their *appreciation* of the degree of control they felt while interacting with the RWT overlapped with those students who conveyed more agreement (indicated by at least one mark of a “4” on the Likert-scale items) with statements about learner ability to control their RWT experiences (P1, P8, and P10). For example, Participants 1 and 10 also evaluated their user control over the RWT more positively than negatively in the qualitative data, and

Participant 8 did not comment about learner control he felt when interacting with the RWT. Perhaps if directly questioned about the control he felt in his RWT interactions in the stimulated recalls or open-ended survey responses, Participant 8 may have also been more positive than negative in his *appreciation*. A like trend was found in the comparison of the more negative-leaning reactions with regard to RQ1c. Likewise, in terms of negative responses, Participants 4 and 7 conveyed the strongest disagreement (indicated by at least one marking of a "1")" with post-task survey statements about learner ability to control the RWT. These parallel the open-ended survey responses.

The triangulation of the data in response to RQ1c thus shows that participants' responses in both qualitative data (open-ended survey responses and stimulated recalls) and quantitative data (post-task Likert-scale survey items) were consistent in terms of learners' propensity to evaluate their control over their RWT interactions in positive or negative ways. The equal number of positive and negative *appreciation* resources in total mirrors the quantitative data reflecting variation in perceptions of the degree of control learners felt during RWT interaction. However, while the group analysis seems to indicate a somewhat equally negative and positive evaluation of learner control over the RWT in the draft revision process, the individual analysis sheds light on how a select few participants' overwhelmingly negative evaluation may have skewed the group results, as more participants were positive than negative in their evaluations of the degree of control they felt when interacting with the RWT.

As the triangulation of data has shown, perceptions of the degree of control learners felt during their RWT interactions remained consistent within participants across the data sources. However, the group analysis seems to indicate somewhat equally negative and positive *appreciation* of learner control over the RWT in the draft revision process. As discussed previously, preparing learners for using the RWT through short demonstrations on how to use the tool would likely contribute to feelings of increased autonomy in the draft revision process (Hong, 2002; Sam, Othman, & Nordin, 2005; Shaw & Giacquinta, 2000). In promoting learner autonomy, however, care should be taken to provide appropriate parameters for language learners' experience with CALL applications. Blin (2004) cautions that learners may exploit unsupervised virtual spaces to create their end products and fail to critically acknowledge the process by which those products were generated; this issue is exacerbated when a learner holds less interest in virtual learning environments or prefers a learning experience not mediated by computers (Christopher, 2006). It is essential that sessions introducing the RWT provide students with enough information to secure their comprehension of the tool's features while still allotting learners the space for controlling their RWT draft revision experience.

Section 4.4. Summary of Findings for RQ1a-c

Data analyses conducted to answer the first set of research questions on learner perceptions of the RWT and their RWT experience revealed that learners responded positively to their RWT draft revision and were optimistic about potential future use of the AWE tool. Generally, learners believed the RWT to be useful to them in their research article draft revision. Noted feedback inaccuracies prompted some negative evaluations and negative emotional responses to perceptions of usefulness of as well as the amount of trust participants felt they could place in the RWT and RWT feedback. There were mixed evaluations of how much control learners felt they had in their RWT interactions, with participants perceiving some features as "limiting" their draft revision process while other RWT functions allotting them "freedom" to engage with the tool as they desired.

In direct response to RQ1a —*How do learners perceive the usefulness of the RWT?* —results from the analyses showed that learners overall deemed the RWT and RWT feedback to be useful in helping them develop their research writing skills. Study participants found the RWT easy to use, understood the tool's feedback, and were prompted to think twice about the intended meaning of the sentences in their drafts. An analysis of learner's *appreciation*, or evaluation, of the tool's effectiveness revealed the RWT to be "helpful" or "beneficial" in guiding them to improve their written drafts. Negative evaluations of the tool's usefulness converged on issues in the RWT analyzer's "misidentification" of the learners' intended rhetorical functions in their sentences and lack of representation of some students' disciplines in the RWT corpus. Learners expressed enthusiasm about future development of the AWE tool, as was evidenced in their willingness to provide many recommendations for ways to improve the RWT. An analysis of learners' conveyed *affect,* or emotional responses, in their discussions of the tool's usefulness demonstrated that some participants "liked" or "loved" particular RWT features, were curious about the RWT and means of incorporating the RWT feedback, and felt motivated to employ the feedback in their section draft revisions. However, negative emotions such as confusion with or surprise by the RWT feedback were also communicated with concern to participants' perceptions of the feedback's inaccuracies. Learners' willingness to use the feedback to revisit their writing shows the writers' desire to ensure they have expressed their goals clearly in their discourse, a fundamental goal of the RWT and a critical variable in learning a genre (Coe, 2002; Hyon, 1996).

Findings answering R1b —*To what degree do learners trust the RWT?* — revealed that participants were reluctant to fully trust the RWT or RWT feedback as well as feedback from other automated systems. Descriptive statistical analyses showed no learner strongly agreed or strongly disagreed with the post-task survey statement "I trust the RWT." However, skepticism about trusting the RWT may have been connected to learners' unwillingness to trust automated systems as a whole, as witnessed in participants' similarly patterned responses on their post-task survey. While many learners agreed that their expectations for RWT interaction were met, some learners felt the RWT draft revision fell short of meeting their expectations, a factor potentially impacting their inability to fully trust the AWE tool. Participants expressed more negative than positive judgment and emotions in their discussions of trust in the tool, alluding to "incorrect" RWT feedback as "issues" or "problems." Interestingly, learners also connected their positive judgments of trust in the RWT to the RWT's functioning, citing the program's capabilities and provisions. An analysis of learners' expressions of *affect* surfaced themes relating respectively to positively and negatively charged *affect*: certainty/uncertainty, confidence/lack of confidence, and awareness/lack of awareness. Importantly, the analysis of *graduation* resources learners used to scale their evaluations of trust in the RWT revealed learners' prominent use of low-scaled resources, suggesting more hesitance to commit to their judgments of trust in the AWE tool, and further echoing learners' inability to completely trust the RWT. While feedback inaccuracies may have promoted negative evaluations of trust in the tool, the process of identifying the RWT's incapacities may well have supported an increase in students' motivation to return to their writing for closer inspection of their intended meaning (Grimes & Warschauer, 2010). Furthermore, learners' awareness of the RWT's limitations and capabilities may serve to ensure learners cultivate appropriate levels of trust in and reliance on the automated system (Reeves & Nass, 1996).

Analyses accomplished to answer RQ1c —*What degree of control do learners perceive they have when using the RWT?* — showed that participants perceived the RWT as limiting certain aspects of their draft revision while allotting them freedom to control other elements of their revisions. Though most participants agreed or strongly agreed that they had the ability to accept or reject the RWT's recommended revisions, there was more variation in responses to a question about how much control learners felt they had interacting with the RWT. Participants conveyed a relatively equal amount of positive and negative *appreciation* in their discussions of the control they felt they had in the RWT draft revision. Being "able to" perform certain functions, like edit their drafts in the RWT or use the colors to skim their texts for the presence of particular functional Moves, came across in positive evaluations of learner control. Negative judgments of learner control regarded restrictions the learners felt the AWE tool was placing on them, feeling they "had to" perform certain tasks the RWT recommended. *Graduation* resources used to scale learners' *appreciation* of their control over the RWT revealed participants' use of more low- and medium-scaled resources, suggesting the students were more reluctant to strongly commit to their evaluations of control over their RWT draft revision process. That RWT allows learners to access and manipulate multiple types of automated feedback may serve to enhance learners' autonomy in the learning process as well as encourage their future use of the AWE tool for RA section draft revision (Cotos, 2011; Wang & Xian, 2011).

The overall positive projected *appreciation* of the RWT and learners' RWT experience shown in the analysis of data answering the RQ1 questions reveal participants' optimism about enhanced capabilities and functions of the RWT, and the subsequent control over the tool these abilities would afford RWT users during draft revision. These analyses also show that the RWT prompted students' return to their section draft to attend to the form and function of their language and clarify their expressions of meaning. This reported return to their section drafts suggests learners were motivated to make interactional adjustments as they negotiated meaning and address issues in both message meaning and language form (Hegelheimer & Chapelle, 2000). In order to better understand this learner engagement in meaning negotiation, this dissertation further explores how learners access and apply the RWT's feedback on subsequent revisions to their texts. These issues are explored in the next chapter concentrating on participants' actual use and reported strategies for use of the RWT for writing revision.

CHAPTER 5.

RESULTS AND DISCUSSION FOR RESEARCH QUESTION 2

Findings related to the second research question guiding the study are reported and interpreted in this chapter. The chapter is structured according to the two research questions that are part of RQ2 on learners' interaction behaviors and strategies using the RWT:

RQ2a: *How do learners interact with the RWT tool?*

RQ2b: *What strategies do learners report using in their interaction with the RWT?*

As in the previous chapter, executive summaries are provided at the start of each section to summarize responses to each research question. In addition to the report of descriptive statistics detailing tallied segments of users' interaction with the RWT, direct quotations, in which participants describe their strategies for using the RWT, are included to help elucidate trends and codes in the qualitative data. Select screenshots from users' recorded RWT interactions are further provided where appropriate to help the reader visualize unique or potentially patterned RWT user behavior.

Results for RQ2a-b on learners' behaviors during their Introduction section draft revision show that participants both exhibited and reported distinct interaction patterns and strategies for using the RWT. The findings answering the first research question on interaction behaviors expose not only the specific RWT features participants interacted with most frequently in their RWT interaction, but also the sequence in which the features were accessed and duration of time allocated to certain interactions. Quantitative and qualitative data analysis findings for the second question reveal a variation in learner preferences for working versus learning new technology as well as a number of differing strategies for the learners' RWT interactions.

Individual learner profile summaries reveal learner preferences for working and learning new technology, with overwhelming preferences for working alone, but learning new technology with a partner or in a group setting. Discussion of the findings on learner RWT behaviors and preferred strategies for RWT interaction is connected to the relevant RQ.

Section 5.1. RQ2a- Learner Interaction Behaviors with the RWT

In responding to RQ2a — *How do learners interact with the RWT tool?—*a combination of quantitative and qualitative analyses were employed. After the executive summary follows: a report of and discussion of findings from the quantitative analysis tallying learner interactivity with specific features of the RWT, a quantitative and qualitative analysis of learners' screen captures, and qualitative analyses of teacher and researcher observations and video screen captures follows to answer RQ2a.

Executive Summary

Results answering RQ2a, concerning how RWT participants use the AWE tool for draft revision, showed that while participants interacted with the RWT in their own unique ways, some trends in RWT interaction behaviors did emerge from the data. In the descriptive statistical analysis of learners' interactions as logged in the RWT database, there were variations in terms of the number of drafts learners submitted to the RWT for analysis, mouse clicks and hovers over certain RWT features, and accessing the Demonstration Module examples of Steps from published research in the designated disciplines. A close comparison of learner interactions with the tool and drafts submitted for re-analysis uncovered that the number of drafts submitted to the RWT did not necessarily indicate that participants interacted more with RWT features during their draft revisions. The analysis of RWT database data further revealed that most of learners' interaction in the analyzed categories included hovers over and clicks on Move-level feedback, which included participants' access to Step-level feedback, hovers over the Step definitions, and hovers over the range bar comparing a breakdown of Moves in the student's Introduction section draft and Introduction sections from published articles in the student's discipline.

A sequence analysis of participants' mouse movements shown in screen recordings from their RWT interactions revealed much variation in the ordering with which students interacted with the RWT; while some participants interacted with a greater number of RWT features, other participants maintained interaction with fewer features and perhaps in a back-and-forth manner. A time-on-task analysis of the screen recording data showed that the participant group spent the most time interacting with the analyzed, color-coded drafts in the Analysis Module, and the second greatest amount of time giving feedback on sentences. Some learners also spent much time interacting with external non-RWT programs, such as Microsoft Word, to record their RWT feedback or revise their section drafts. The analysis further revealed learners' concentration on the Steps that "need work" instead of the "good work" areas, likely implying their desire to attend to problematic aspects of their writing and to conform their writing to that which is more representative of published writing in their disciplines.

Analyses of teacher and instructor observations of the participants' RWT interactions help elucidate learners on-screen interactions as well as off-screen interactions with the instructor or other classmates. Learners' interactions with the instructor revealed some intended goals of learners trying to "fix" their drafts, using the feedback to re-examine their intended rhetorical meanings, exploiting Demonstration Module examples, and editing their texts both in and out of the RWT text editor. Observational notes also showed some learners' worked independently with the RWT on their drafts revisions, while others communicated or collaborated with classmates during their RWT interaction. The presence of the instructor during learners' RWT interactions served to clarify learners' questions about the purposes of the tool and functioning of the tool, understand the RWT feedback accuracy, and even refine students' comprehension of rhetorical functions of Moves and Steps in Introduction sections. Also, echoing findings from *affect* analyses of learner perceptions in RQ1a-b, an analysis of the teacher and observer data showed students expressing both negative emotions, such as frustration and confusion, and positive emotions, such as excitement and anticipation about the tool's future development, during their RWT interactions.

In all, findings answering RQ2a on user interaction behaviors expose not only the specific RWT features participants interacted with most frequently in their draft revisions, but also participants' unique and patterned RWT interactions. Detailed descriptions of learners' interactions with the RWT, figures and graphs showing patterned learner–RWT interaction behaviors, and a discussion of the findings follows.

Quantitative Analysis for RQ2a

An elemental part of the data analysis for answering RQ2a on actual user behaviors during RWT interactions entailed tallying the number of learners' clicks on particular features of the tool, the number of texts submitted for analysis, the number of times the Demonstration Module examples were accessed, and numbers of thumbs up/thumbs down/neutral thumb marker feedback clicks the student gave to the RWT based on the Analysis Module's sentence-level feedback. This quantitative analysis involved tabulating the frequency of learners' mouse clicks (stored in the RWT database and accessed by the researcher post-interaction) on the above specified features of the tool, first by individual learner then by a comparison of all learners in the participant group. Table 5.1-1 displays the descriptive statistics summarizing totals for group interaction behaviors in terms of the frequency with which participants clicked on particular RWT features or submitted RWT drafts.

Table 5.1-1

Descriptive Statistics for Group Tallies of Frequency of Interaction with RWT Features

User Interaction Feature	Mean	Median	St. Dev.
# of drafts submitted	3.54	2	4.98
Sentence feedback hovers	116.72	119	63.63
Move feedback hovers	308	294	196.3
Sentence clicks	65.09	55	38.33
Thumb marker: down	6.36	5	5.22
Thumb marker: up	1.36	0	3.64
Thumb marker: neutral	1.82	2	1.25
Pie chart hovers: student section	2.63	3	2.11
Pie chart hovers: discipline section	8.27	6	8.29
Demonstration Module step examples accessed	4.54	3	3.5

What is clear from Table 5.1-1 is the variation in the frequency with which users interacted with certain features of the RWT. For example, the Mean value for participants' hovers over Move-level feedback is 308, while the Mean for hovers over sentence-level feedback is less than half this amount (116.72). These numbers imply students accessed the Move-level feedback on the right side of the screen which showed the breakdown of what specific Steps the students incorporated into their text and what Steps needed to be integrated more into the draft. This Move-level feedback categorization also included students' hovers over the definitions of each Step and hovers over the range bar displaying the percentile within which the student's draft adhered to the inclusion of each Introduction section Move in published articles in the discipline through a color-coded spectrum-type comparison.

Another observation in the group's overall behavior which can be made from the descriptive statistics in Table 5.1-1 includes students' tendency to more often give thumbs down (Mean value = 6.36) than thumbs up (Mean value = 1.36) or a neutral thumb (Mean value =1.82) marking to the analyzer based on feedback they received in each sentence. To briefly reiterate from the more detailed description in the Methods section, a marking of thumbs down signifies the learner disagreed with the RWT feedback provided for a given sentence, while a marking of thumbs up indicated the learner agreed with the RWT sentence feedback, and a marking of a neutral thumb signified a learner's partial agreement with the RWT's sentence-specific feedback. The values shown in Table 5.1-1 thus suggest that participants more actively disagreed with the RWT feedback on particular sentences than they either agreed or partially agreed with the feedback.

It can also be deduced from the statistics reported in Table 5.1-1 that the learners were interested in the percentage of Moves in published Introduction section as displayed in pie charts at the bottom of the RWT Analysis Module page. Participants more frequently hovered over the pie charts showing a color-coded Move distribution for the average Introduction section of published articles in the students' disciplines (Mean value = 8.27) than they hovered over the pie chart showing the Move distribution for their own section draft (Mean value= 2.63).

Furthermore, large Standard Deviation values of the frequency of use of particular RWT features indicate wide variation in individual participants' interaction patterns in their RWT draft revision. Though the group's Mean value for the number of drafts submitted for analysis is 3.54 and the Median value is 2, the Standard Deviation value is 4.98, a large value for a small group of 11 study participants and one which suggests much variation in the number of drafts individual learners submitted to the RWT for analysis during this initial draft revision.

The largest Standard Deviation values are evident for students' hovers over sentence-level feedback (St. Dev. value of 63.63) and Move-level feedback (St. Dev. value of 196.3), and clicks on sentences in the students' analyzed text (St. Dev. value of 38.33). These enormous Standard Deviation values indicate huge differences in how individual leaners accessed feedback on their draft in the RWT Analysis Module; this finding indicates learners processed and interacted with the RWT feedback in varied ways, an idea explored in more depth in later qualitative analyses of learner behaviors using the RWT to revise their writing.

Figure 5.1-1 provides an alternative view of the group's frequency of use of particular features of the RWT. The pie chart compares user interactivity with the RWT by comparing mouse activity (mouse hovers, mouse clicks, and instances of access to the Demonstration Module) with specified components of the RWT. It is perceptibly apparent from the distribution of user RWT interaction behaviors in Figure 5.1-1 that hovers over Move-level feedback comprise more of user interaction with the RWT than all other behaviors combined. It must again be noted, however, that what constitutes hovers over Move-level feedback includes learners' access to the Analysis Module suggestions for improvement of the draft at the Step level, hovers over the Step definitions, and hovers over the range bar comparing a breakdown of Moves in the student's Introduction section draft and Introduction sections from published articles in the student's discipline. This type of hovering activity is not unexpected, considering the Move-level feedback section provides learners detailed analyses of what Steps they have incorporate well into their writing and which still need improvement. The novice writers are therefore likely to gather some of the most individualized feedback on their drafts in this Move-level feedback section.

What is also evident from Figure 5.1-1 is how little students accessed other features of the RWT in their overall RWT draft revision experience. For example, students rarely accessed authentic, published examples of particular steps available in the

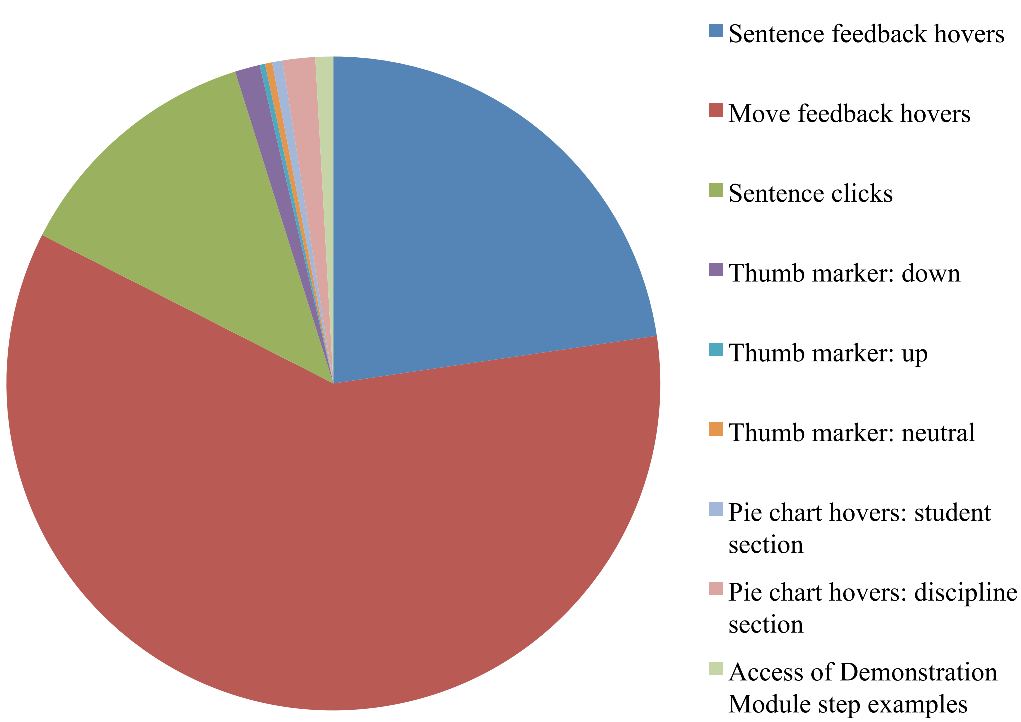


Figure 5.1-1. Distribution of user behaviors of overall group in RWT draft revision

Demonstration Module. Participants generally accessed the feedback provision feature less, giving feedback to the analyzer by agreeing (using thumbs up markers), disagreeing (using thumbs down markers), or partially agreeing (with a neutral sideways thumb marker) with the RWT's sentence-level feedback; this could possibly be a result of students feeling that there was little to gain from giving feedback to the analyzer other than aiding the improvement of the RWT. In other words, learners may have felt they could benefit little from indicating their [dis]agreement with the RWT analyzer's feedback in terms of improvement of their own writing. Also, in comparison to the amount of interaction with other RWT features, pie charts were accessed infrequently by the learners.

Exactly how the participants varied in their individual use of the RWT is, however, may be concealed by both the descriptive statistics depicting overall participant group usage and the graph showing a summary of the group's interaction with certain RWT features. Therefore, RWT interaction behaviors unique to individual learners must be further investigated. To better envision particular learners' different interaction behaviors with the RWT, Table 5.1-2 shows a breakdown of the frequency of specific interaction features by participant.

What is apparent from Table 5.1-2 is the wide variation in user interactions with particular features of the RWT, as evidenced in the numbers in the "Totals" column. The values for the overall totals show a more detailed picture of what could be gleaned from the descriptive statistics summarizing the overall group activity. The greatest discrepancy in the total values includes the heightened number of hovers over Move feedback compared to the sentence feedback hovers, as already pointed out in the discussion of Figure 5.1-1.

Also clear from an investigation of the values in Table 5.1-2 are the dissimilarities among individual learners in terms of how they interacted with the RWT for section draft revision. For example, the number of drafts learners submitted to the RWT for analysis varied widely. While many participants (P5, P8, P9, P10, and P11) submitted only one draft to the RWT for feedback, Participant 4 submitted 18 drafts, the most number of drafts

Table 5.1-2

Frequency Tallies of Individual Participant's Interaction with RWT Features

User Interaction Behavior	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	Totals
# of drafts submitted	2	5	4	18	1	2	3	1	1	1	1	39
Sentence feedback hovers	154	262	5	128	147	121	111	78	119	71	88	1284
Move feedback hovers	355	816	19	333	374	294	264	192	323	185	233	3388
Sentence clicks	55	50	44	76	45	117	73	117	9	16	114	716
Thumb marker: down	5	3	6	6	1	4	17	15	1	8	4	70
Thumb marker: up	0	0	0	3	0	12	0	0	0	0	0	15
Thumb marker: neutral	3	3	3	3	1	1	1	2	0	3	0	20
Pie chart hovers: student section	1	4	0	4	3	4	1	5	1	6	0	29
Pie chart hovers: discipline section	3	26	1	2	21	12	6	7	8	1	4	91
Demonstration Module step examples accessed	3	3	6	11	2	4	1	5	11	2	2	50

submitted amongst all participants in the group. All learners except for Participant 4 subm between one and five drafts. For those learners who submitted only one draft it means that whether they did or did not make edits to their draft, they did not submit the revised versic the RWT for feedback and thus only received feedback on the initial submitted draft.

Participant behaviors also contrasted substantially regarding their hovers over sent feedback. There were two participants whose behavior was extreme pertaining to sentence feedback hovers: Participant 2 hovered over sentences 262 times, while Participant 3 only five total sentence hovers. All other participants' sentence hovers fell in between these tw extreme outlying values, with totals ranging between 71-154 hovers.

Much variation also existed in the number of times learners clicked on analyzed sentences in their draft. Several participants clicked over 100 times on particular sentence text (P6 and P8 117 times each and P11 114 times), whereas two participants clicked on sentences less than 20 times (P10 16 times and P9 just nine times). The remaining particip from clicked on from 44 to 73 sentences. Potential reasons for this variation are explored i discussion of the user behaviors.

Another area of much disparity in user behavior was users' hovers over Move feed Again, two participants were outliers in their interaction with the Move-level feedback wi Participant 2 totaling 816 hovers over the Move-level feedback and Participant 3 hovering the Move feedback only 19 times total. Again, Participant 2's behavior represented a valu the upper extreme of the overall group totals. All other participants accessed the Move-lev feedback between 185 to 374 times through hovers.

While much participant behavior was unique to individual learners, Table 5.1-2 lik shows some similarities in how participants interacted with the RWT, particularly in term markings for agreement (giving thumbs up), disagreement (giving thumbs down), or partial agreement (giving neutral thumb marker) with the RWT analyzer's feedback for certain sentences. Most participants (except for P4 and P6) gave no thumbs up markers to the RWT to indicate their agreement with the sentence-level feedback. However, Participant 6 gave 12 thumbs up markers and Participant 4 gave three. By comparison, Participant 6 participant gave only four thumbs down marks and one neutral thumb on sentence feedback. Also similarly, all participants, aside from Participant 6, provided more thumbs down then either thumbs up or neutral thumb markings to the RWT. (Participants 2 and Participant 5 gave the same amount of thumbs down and neutral thumb marker feedback). These results thus show that learners were more active in their disagreement with the RWT's feedback for the sentences in their draft.

Variations further persisted in how individual learners accessed the pie chart data. Most learners hovered over the pie chart depicting Move distribution in an average Introduction section text published in their discipline as compared to a Move distribution in their own draft. Only Participants 4 and 10 hovered over their own Introduction section draft pie charts more than the average Introduction section Move-feedback pie chart. By contrast, Participants 3 and 11 did not access their own section pie charts distributions of own section at all, but did hover over the pie charts of Moves in Introduction sections published in their disciplines. Table 5.1-2 also illustrates differences in individuals' behaviors accessing the different pie charts showing Moves. Participant 2, for example, hovered over the pie chart of the average published Introduction sections article 26 times, but hovered over the pie chart showing the Moves in her own text only four times. Participant 5's access of the Move distribution pie charts mirrored Participant 2's behavior, hovering over the pie chart showing Moves in published articles in her discipline 21 times and hovering over the pie chart showing Moves in her own text only four times.

Finally, there were discrepancies in the number of examples learners explored in published research articles in the Demonstration Module. The most number of times users accessed the Demonstration Module examples was 11 (with P9 and P4 each accessing 11 examples), while Participant 7 only explored one Step example from published research articles in the Demonstration Module.

Another means of viewing RWT users' interaction during draft revision may be to observe if there is any relationship between the number of drafts submitted to the analyzer and the total amount of interactivity (including pie chart hovers, clicks, markings of thumbs up, down, and neutral, and accessing of Demonstration Module examples). Table 5.1-3 provides a detailed summary of participants' interactivity with the RWT during their draft revision.

Table 5.1-3

Details of Individual Participants' Interactivity with the RWT

Participant	Drafts Submitted	Total Mouse Activity
P1	2	593
P2	5	1208
P3	4	98
P4	18	602
P5	1	621
P6	2	604
P7	3	502
P8	1	451
P9	1	483
P10	1	311
P11	1	454

Note: "Total mouse activity" includes total number of mouse clicks and hovers, thumb markers, and times Demonstration Module examples were accessed

The numbers totaling mouse activity displayed in the table show some distinctions in how individual users interacted with the AWE tool. For instance, Participant 2's mouse clicks, hovers, feedback markers, and Demonstration Module example explorations totaled 1,208, while Participant 3's totaled only 98; these two participants' activity during draft revision, however, represented the most extreme user behaviors. The remaining participants averaged between 311 and 621 instances of total recorded activity. This average set included Participant 4, who submitted the most number of drafts (18) of all study participants.

To gain a sense of whether increased draft submission related to total mouse activity during the draft revision, Figure 5.1-2 displays a comparison of how many drafts learners submitted compared to their overall degree of interaction with RWT features. Each red dot signifies an individual study participant. The dot's location along the X axis depicts the total number of drafts submitted by a given student, while the dot's location along the Y axis shows

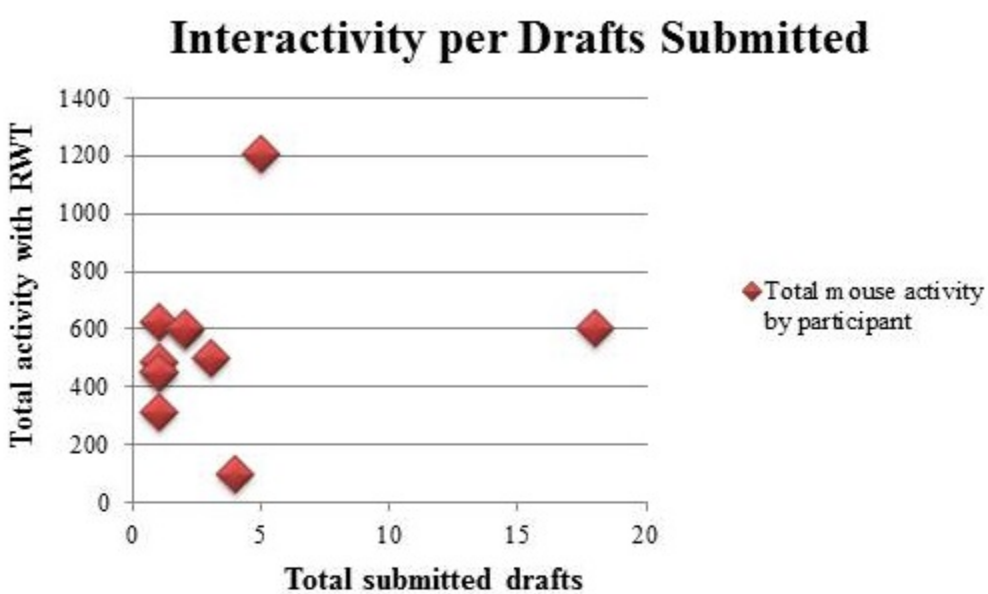


Figure 5.1-2. Participant total interactivity compared to number of drafts submitted

how much the participant interacted with the RWT (including all hovers, clicks, and number of times Demonstration Module examples were accessed).

What emerges from the data comparison displayed in Figure 5.1-2 are clear outliers from what could be seen as somewhat average learner interaction behaviors with the RWT. An obvious trend in the data shows the majority of participants interacted with the RWT similarly, submitting between one to four drafts and totaling between 311 and 621 instances of recorded mouse activity. However, the amount of mouse activity did not increase for Participant 4, who submitted 18 drafts to the RWT analyzer; her total number of mouse clicks and hovers, feedback markers on individual sentences, and examples accessed in the Demonstration Module was within the average for the group (602), albeit at the high end of that average. Still, Participant 2, who engaged far more than other participants in terms of mouse activity (instances totaling 1,208) did submit the second highest number of drafts (five) to the RWT analyzer; increased number of drafts submitted, however, may not automatically imply heighted interactivity with RWT features. The participant who was the least activity (P3) in terms of mouse activity (total 98 instances recorded) submitted more drafts (four) than most other participants. Therefore, increased number of drafts submitted to the RWT does not necessarily indicate the participant interacted more with RWT features during her/his draft revision.

As the results show, there was a high number of hovers over the Move feedback range bar, especially in comparison to participants' interaction with other RWT features. It should be noted that while this finding seemingly demonstrates RWT users favoring Move-level feedback, the number of mouse hovers could be potentially deceiving, because learners may have actually been accessing the Step-level feedback in the dropdown menu available with each Move. The RWT's Move-level range bars are active components which display Step-level feedback on the users' click. In other words, RWT users cannot access Step-level feedback without hovering over and interacting with the Move-level feedback. Because the RWT database tracks and stores both access of Step-level and Move-level feedback as a "Move feedback hover," the resulting value masks the group's and individual participants' interaction with feedback at the Step level. A more thorough examination of the screen capture recordings of participants' interactions with the RWT will assist in exposing participants' true interaction patterns and distinguishing between Move- and Step-level feedback access.

The large variation in how learners interacted with the RWT could be a result of a number of factors. For example, some students may have been more focused on gathering individual sentence-level feedback on their drafts and thus clicked on or hovered over their analyzed sentences with more frequency. Other learners may have been more attracted to detailed Move-level feedback which provided a breakdown of the effective or ineffective incorporation of Steps specific to the Move; because the Move-level feedback gives direct suggestions for how to improve RWT users' texts, learners may have been attracted to the explicitness of this feedback, as it provides clear instruction for how the learners could proceed with draft revisions. Other potential variation in learners' behaviors may be a result of their computer experience or individual learner variables; these potential explanations will be explored in Chapter 6 in a discussion of findings on RQ3 about learners' perceived effect of technological background and learner characteristics on their RWT interactions.

While it may seem a discouraging finding that many learners submitted few drafts to the RWT analyzer for re-analysis, the results are not entirely surprising in comparison to findings from past research. The objective of AWE programs is to enhance writing practice among language learners, but this goal is not always met when technology is integrated into writing instruction. Attali (2004) observed that automated systems stimulate relatively few draft revisions and re-submissions in the writing classroom. The researcher reasons the low number of revisions and submitted drafts could be a result of students feeling time constraints to make multiple revisions to a piece of writing during the class period (Attali, 2004). It may be that RWT users felt the time allotted for in-class interaction with the RWT was too limited for them to make substantive revisions to their drafts. Following up with study participants to determine whether they accessed the RWT after their initial in-class interaction or made revisions to their drafts at home based on the RWT feedback may help clarify whether class time restrictions contributed to the low number of drafts re-submitted to the analyzer.

The low number of drafts submitted by participants may also be misleading when examining participants' application of the RWT feedback for draft revision. Though it may seem that a lower number of submitted drafts would indicate participants' decreased interaction with their texts, learners may simply have decided not to re-analyze their drafts after making revisions. In other words, the writers may have made substantial changes to their drafts, but not submitted these changes for re-analysis to the RWT analyzer. This potential explanation is confirmed by the large number of sentence clicks on participant texts, indicating student engagement with their drafts. Another possibility is that, because the RWT database only considers drafts as resubmitted when changes have been made to the drafts (i.e., the drafts differ from one to another), participants may also have analyzed their drafts again in expectation of different feedback, but without having made changes. For this re-analysis, the participants may have simply chosen another discipline for cross-analysis with their draft with the expectation they would receive different feedback, a plausible scenario considering many learners indicated their exact discipline or program of study was not represented in the RWT corpus. Again, a detailed analysis of students' screen capture recordings will reveal participants' actual behaviors editing and re-analyzing their texts.

The presence of more negative (marked by thumbs down markings) than positive (marked by thumbs up markings) feedback conveying disagreement and agreement, respectively, with the analyzer's feedback could be explained in a few different ways. The most straightforward explanation would be that the heightened number of thumbs down markers could imply participants simply disagreed more than they agreed with the RWT sentence-level feedback. Another explanation could be that the participants provided feedback on particular sentences only when they disagreed with how the RWT analyzed a sentence; in other words, if there was no problem with the analysis, the participant may have skipped providing feedback on the sentence, but when the RWT analyzer's results did not match the students' intended rhetorical meaning for a given sentence, the student may have marked thumbs down for the sentence. According to this second possible explanation, the RWT users may have interpreted providing feedback as cataloging their complaints about the system to improve the RWT analyzer's functioning. Surveying the participants to clarify their purposes behind giving positive or negative feedback would clarify their intentions and help account for the heightened occurrence of negative feedback to the analyzer.

Confirming the findings from RQ1a revealing participants' interest in visual feedback, findings from RQ2a also show that the RWT users were drawn to the visual feedback in the Analysis Module. Learners' attraction to the pie charts showing Move distributions and color-coded sentence-level feedback on the student drafts can be interpreted as reflecting the RWT's visual appeal, a positive finding according to research in human–computer interaction. Aesthetics of a computer program are regarded as augmenting users' interactive experience

(Tractinsky, 2014). Because visual appeal is found to positively correlate with an application's enhanced usability (Cawthon & Moere, 2006; Lavie & Tractinsky, 2004; Sonderegger & Sauer, 2010), RWT users' attraction to visual feedback may promote perceptions or actual enhanced usability of the program for research article section draft revision.

The large number of hovers over pie charts showing Move distribution in average discipline-specific research articles may be explained by students' recognition that other options showing feedback on their own writing are available to them throughout the Analysis Module and in different formats. By the time participants access the Move distribution pie charts, located at the bottom of the Analysis Module page and requiring users to scroll down to access, the learners have already been exposed to other forms of feedback related to their own draft. Possibly, because the RWT users are aware of the wealth of additional feedback specific to their own writing, they hovered over or clicked on published section pie charts anticipating more detailed information about the distribution of Introduction section Moves in published writing in their field.

The increased number of hovers over pie charts displaying Move distribution in an average published research article in the participants' discipline, as opposed to hovers over pie charts displaying Move distribution in the learners' drafts, could also represent participants' curiosity about what is commonly accomplished by published authors in the discipline. This curiosity about the presence of Moves in published Introduction sections may be interpreted as learners aiming to understand the genre conventions for their discipline. In the New Rhetoric approach to genre, this type of interactivity could be construed as encouraging, as it marks a departure from students' reliance on the instructor to disseminate information about the research article genre (Bazerman, 1988). Instead, the interaction with the published research Move pie charts shows learners' interest in understanding more about how the research article genre is realized in their field; this type of genre engagement not only helps the novice writers situate their own drafts in the texts' anticipated target social contexts, but further shifts the responsibility of genre learning to the writer, as opposed to the instructor.

Learners' curiosity about disciplinary writing was not necessarily reflected in the number of times students interacted with the Demonstration Module. The Demonstration Module, providing RWT users the ability to search and retrieve authentic, contextualized Move and Step examples in published research, was accessed relatively few times in relation to the numbers indicating frequency of access of other RWT features. However, these results may distort participants' actual exploitation of the Demonstration Module. Because this analysis of the RWT database data targeted only the number of times participants accessed the Demonstration Module and not the length of time the Demonstration Module was used, study participants may have interacted with the module a great deal, though it is not exhibited in the data.

Qualitative + Quantitative Analysis for RQ2a

Analysis of video screen recordings of participants' RWT interaction. To determine notable patterns or trends in students' interactions with the RWT, individuals' screen captured interactions with the RWT were analyzed primarily qualitatively, but also in part quantitatively. To systematically investigate learners' interactivity with particular features of the AWE tool, selected analytic techniques from the field of human–computer interaction, the sequence model and the time-on-task model (Phipps, Meakin, & Beatty, 2011), were applied to the analysis of screen captures. In applying the sequence model to the data analysis, learner interactions with particular features of the RWT were observed and recorded in the chronological sequence in which they occurred in each participants' recorded interaction. The amount of time learners spent interacting with the RWT features of the tool was also examined and recorded. In addition, observational notes on each learner's RWT interaction were taken to fill in potential gaps not accounted for in the sequence or time-on-task analyses, therefore enabling a deeper understanding of participants' use of the AWE tool for draft revision. What follows is a report of the combined qualitative and quantitative analysis of the video screen captures, outlining not only individual participants' interaction with the RWT, but also group trends which emerged from the data.

Sequence analysis results. The screen capture analysis targeting the sequence with which learners engaged with particular features of the RWT showed some interesting patterns with regards to both individual and group interactivity with the AWE tool[7]. The interaction categories that were targeted in this sequence analysis were as follows: interacting with Move-level feedback, interacting with Step-level feedback, interacting with sentence-level feedback (in the form of the RWT's analyzed color-coded draft), accessing pie charts, editing own text, re-analyzing draft, providing feedback to the RWT, accessing examples in the Demonstration Module, taking notes in another computer-based program outside the RWT, editing the draft in another computer-based program outside the RWT, accessing the Move or Step definitions in a document outside the RWT, and accessing the Move or Step definitions in the RWT. These categories were selected because, as was revealed in a preliminary analysis of several participants' screen capture recordings, they comprise the majority of participants' interaction

[7] Because it has been shown that mouse movement and eye movement correlate and reveal computer users' cognitive engagement with elements on a screen (Chen, Anderson, & Sohn, 2001), the movement of each participant's mouse, as indicated by the cursor on the screen, was observed to discern interactivity with the AWE program, including both the sequence and time of interaction with each feature.

with the RWT. (Analysis of the screen recordings showed that few participant–RWT interactions fell outside these designated categories.)

For the purposes of deciphering learners' interactions in a more straightforward and organized way, each interaction category was assigned an alphabetical code. Table 5.1-4 provides a summary of the codes used for each interaction and their corresponding interaction category.

Table 5.1-4

Codes Used for Assigning Participant–RWT Interaction Activity

Code	Interaction category
A	Interacting with Move-level feedback
B	Interacting with Step-level feedback
C	Interacting with sentence-level feedback (color-coded text)
D	Accessing pie charts
E	Editing text in RWT
F	Re-analyzing text
G	Providing feedback to RWT
H	Accessing Demonstration Module examples
I	Taking notes in non-RWT computer-based program
J	Editing in non-RWT computer-based program
K	Accessing Move/Step definitions in external doc.
L	Accessing Move/Step definitions in RWT

A brief description of each category may also be helpful in understanding the learner–RWT interactivity examined in the analysis of screen capture recordings. "Interaction with Move-level feedback" (code category A) was identified by mouse hovers over and clicks on RWT feedback provided at the Move level in the Analysis box on the right side of the Analysis Module page; this included any hovers over or clicks on the range bar showing the RWT user's goal for the inclusion of a particular Move in the Introduction section based on the cross-comparison of Introduction sections in published articles in the designated discipline. When an RWT user clicked on, hovered over the dropdown menu specifying the particular Steps that were incorporated well or needed improvement in the draft, this was recognized as “interacting with Step-level feedback” (code category B). “Interacting with sentence-level feedback” (code category C) included the user’s hovering and clicking interactivity with the analyzed and color-coded text in the “Your text” box on the left side of the Analysis Module page. A learner’s “accessing of pie charts” (code category D) was classified as all hovers on and clicks on one or both of the pie charts depicting either the presence and composition of Moves 1 through 3 in the learner’s analyzed draft or that of the Moves in an average Introduction section in the discipline the student had specified. “Editing own text” (code category E) was distinguished as draft editing which occurred in the RWT’s text editor box on the Analysis Module page.

When the learner submitted this edited section draft again to the RWT to receive new feedback, the action was classified as “re-analyzing draft” (code category F). As a student clicked through her RWT-analyzed, color-coded draft and either clicked on the thumb buttons indicating agreement (thumbs up), disagreement (thumbs down), or partial agreement (neutral, sideways thumb marker) with the RWT Step-level feedback on a particular sentence or wrote out feedback in the “Comments” box, this activity was assigned the code “providing feedback to the RWT” (code category G). “Accessing examples in the Demonstration Module” (code category H) referenced when a RWT user opened the Demonstration Module, used the Demonstration Module’s concordancing tool, and/or read or retrieved examples from the RWT corpus in the Demonstration Module. At times, observation of the screen capture recordings revealed that the learners were taking notes on their individualized RWT feedback or Demonstration Module examples in external documents; this activity was assigned the code “taking notes in another computer-based program outside the RWT” (code category I). Some learners also engaged in “editing the draft in another computer-based program outside the RWT” (code category J); in every instance the external document was a Microsoft Word document, and the edited version was sometimes saved as a new draft with a different name. To recall the function of particular Moves or Steps, a learner may have engaged in either "accessing the Move or Step definitions in a document outside the RWT" (code category K) from a pdf saved on the class's course Moodle (course management system) page or "accessing the Move or Step definitions in the RWT" (code category L) using the "Learn more" link available for each Step in the dropdown menu under the corresponding Move.

Table 5.1-5

Sample of One Learner's Sequence of Coded RWT Interaction: Participant 7

Sequence	Interaction category
A	Interacting with Move-level feedback
C	Interacting with sentence-level feedback
B	Interacting with Step-level feedback
C	Interacting with sentence-level feedback
G	Providing feedback to RWT
C	Interacting with sentence-level feedback
B	Interacting with Step-level feedback
D	Accessing pie charts
G	Providing feedback to RWT
B	Interacting with Step-level feedback
H	Accessing Demonstration Module examples
C	Interacting with sentence-level feedback
G	Providing feedback to RWT
E	Editing text in RWT
F	Re-analyzing text
D	Accessing pie charts
B	Interacting with Step-level feedback
E	Editing text in RWT
F	Re-analyzing text
C	Interacting with sentence-level feedback
B	Interacting with Step-level feedback
C	Interacting with sentence-level feedback
B	Interacting with Step-level feedback

As each screen recording was observed, the sequence of learners' on-screen interactions was identified using the codes in Table 5.1-4. For brevity purposes, a sample of one such coded interaction is provided above. The sample coded sequence, depicted in Table 5.1-5, was chosen because it is the shortest interaction sequence strand. This strand represents Participant 7's interactivity with the RWT. (The full report of every participant's sequenced interactions with the RWT was too space-consuming to include in the body of this dissertation, and is instead provided in Appendix D.)

While a legible, text-based report of each RWT user's interaction sequence is not feasible to present due to the sheer length of the strands, it may be revealing to at least see an overview of the sequence of participants' interactions with the RWT in an abbreviated format. Table 5.1-7 shows a breakdown of the sequence of interactions by participant with each interaction category color-coded for enhanced legibility. A key exemplifying which color was assigned to which interaction category is provided in Table 5.1-6.[8]

Table 5.1-6

Key Indicating Color of Interaction Code Category

Key	Interaction category
A	Interacting with Move-level feedback
B	Interacting with Step-level feedback
C	Interacting with sentence-level feedback
D	Accessing pie charts
E	Editing text in RWT
F	Re-analyzing text
G	Providing feedback to RWT
H	Accessing Demonstration Module examples
I	Taking notes in non-RWT computer-based program
J	Editing in non-RWT computer-based program
K	Accessing Move/Step definitions in external doc.
L	Accessing Move/Step definitions in RWT

[8] Refer to Table 5.1-4 for codes assigned to interaction category.

The colors in the table are roughly grouped into like color families when interactions share similarities. For example, darker blue is used to represent interactions with feedback at the Move level and lighter blue indicates learner interaction with feedback at the Step level. Similarly, darker purple is used to show participants editing in non-RWT programs, while lighter purple signals editing in the RWT text editor.

What the interaction sequence strands show are the number and frequency of interactions each participant engaged in during the course of the approximately 55-minute section draft revision using the RWT. Because all recorded interactions lasted roughly the same amount of time, the length of the strand would suggest more or less frequent interaction with particular features of the RWT or external documents used to assist the draft revision process. With this in mind, in observing the figure, it is obvious there exists much variation in the length of the interaction sequence strands, indicating great variability in the frequency with which individual participants engaged in particular interactions during their draft revision. The interaction sequence strand for Participant 7, for example, is the shortest among the 11 participants; this short strand implies not that Participant 7's interaction time was less, but rather that the learner possibly switched back and forth amongst varied interactions less frequently than the other learners. By contrast, Participant 4's interaction sequence strand, already the longest amongst all participants', was cut short for a more succinct data display. In reality, this strand was more than twice as long as what is shown. Participant 4's lengthy strand denotes the heightened frequency of interactivity, in a back-and-forth style, among the various specified interaction categories.

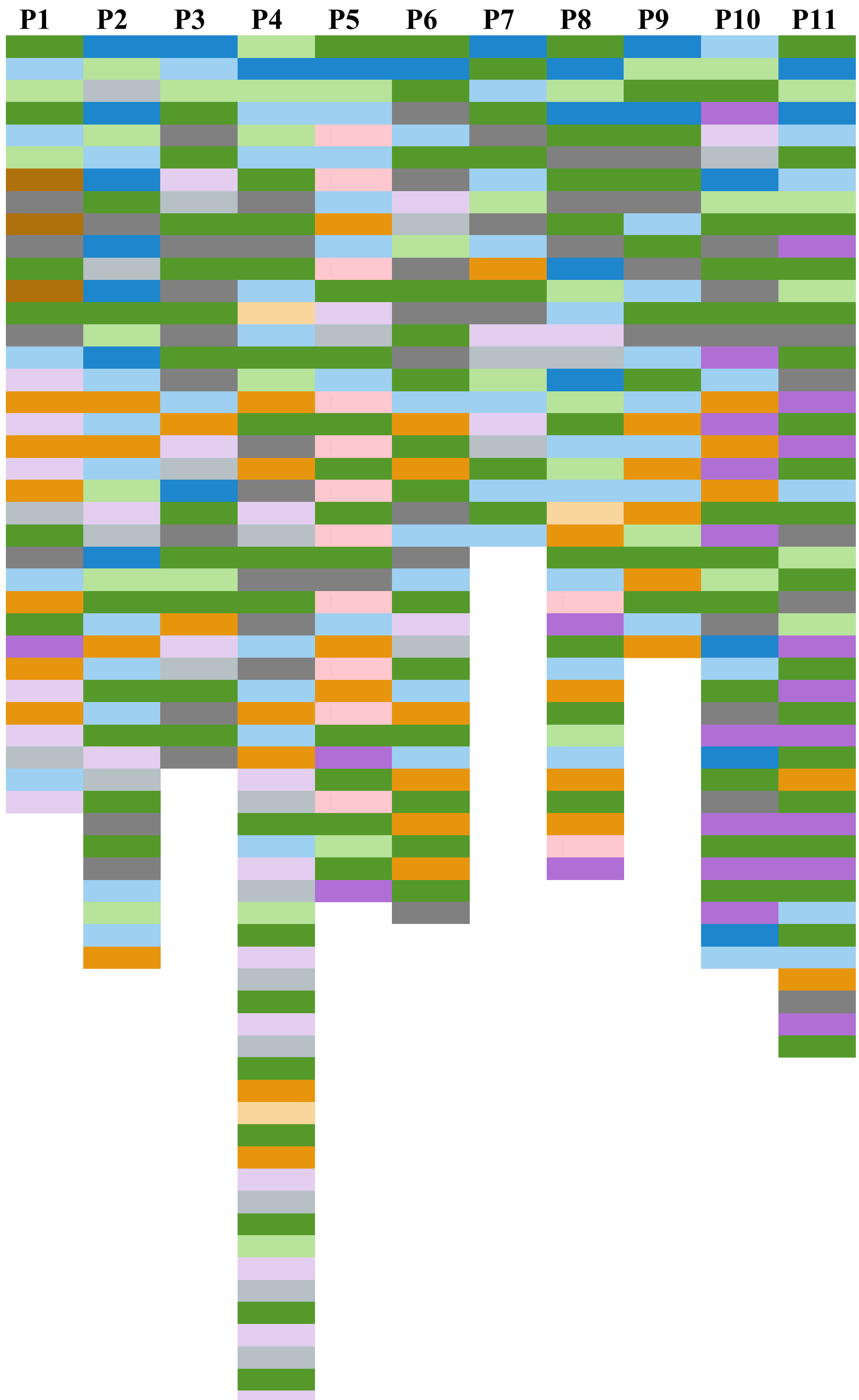
Not only do the interaction sequence strands illustrate the frequency of interactions among the participants, but also show in which interactions which participants engaged. Most participants, for example, did not access Move or Step definitions at all during their draft revision with the RWT. However, three participants did seek clarification on the definitions of Moves or Steps during their RWT interaction. As indicated by the brown bars visible in Table 5.1-7, Participant 1 accessed Move and Step definitions for Introduction sections by opening an external document outside the RWT three separate times during her recorded RWT interaction. Participants 4 and 8 each clicked on the "Learn more" help feature once during their recorded RWT interactions, accessing Move and Step definitions within the RWT.

In general, the sequence strands also clearly show which interaction categories were less engaged in overall by participants. In addition to accessing Move and Step definitions outside or within the RWT, another interaction rarely accomplished by participants was note-taking in external documents outside the RWT (depicted by the presence of pink color blocks). While most learners did not take notes on their RWT feedback in an external document (always in Microsoft Word, as the screen recordings show), Participants 5 and 8 did. As Table 5.1-7 illustrates, Participant 5 went back and forth between taking notes in a Microsoft Word document and interacting with her RWT-analyzed color-coded text in the Analysis Module. More interactions occurred between the two times Participant 8 took notes in an external Microsoft Word document during his RWT interaction.

An important element of the RWT interaction sequence strands pertains to the presence of light gray color blocks which represent a learner's re-analysis of a draft in the RWT. As could be predicted, the presence of more light gray color blocks in the interaction sequence strand signals more frequent re-analysis of the learner's section draft in the RWT; in other words, those who submitted more drafts to the RWT would contain more light gray color blocks in their interaction sequence strands. This explains the repeated presence of the light gray color blocks

Table 5.1-7

Color-Coded Strands Depicting Individual Participants' Sequence of RWT Interactions



appearing in the sequence strand for Participant 4 who, as reported earlier, submitted 18 drafts to the RWT for re-analysis, and the lack of light gray blocks in the strands for learners who submitted fewer drafts to the RWT for analysis.

Also highlighted by the interaction sequence strands are those activities engaged in more frequently among the 11 participants. As Table 5.1-7 shows, all participants accessed the Step-level feedback (light blue color blocks), interacted with their color-coded feedback at the sentence level (dark green color blocks), edited in the RWT text editor box (light purple color blocks), interacted with examples in the Demonstration Module (orange color blocks), provided feedback to the RWT (dark gray color blocks), and accessed pie charts (light green color blocks). The interaction sequence strands also show that not all participants accessed the Move-level feedback (dark blue color blocks), edited their text in a non-RWT computer-based program (dark purple color blocks), accessed Move/Step definitions in the RWT (beige color blocks) or in external documents (brown color blocks), re-analyzed their text (light gray color block), or took notes in an external document (pink color blocks).

The color-coded interaction sequence strands also illuminate which features individual participants interacted with at what points in their 55-minute RWT interaction as well as how frequently certain interactions were performed. For one, the interaction sequence strands have the ability to reveal those interactions which occurred in a repeated, back-and-forth manner. The sequence analysis showed that participants often engaged in repetitive behaviors wherein they interacted with one RWT feature then another in a back-and-forth fashion between two interaction code categories. Figure 5.1-3 shows an example of one such interaction pattern where a learner (Participant 8) interacted in a back-and-forth way with the RWT Demonstration

Module and his draft in an external Microsoft Word document. The screens shown in the figure were captured directly from Participant 8's recorded RWT interaction.

Accessing the Demonstration Module (code category H) was a popular interaction engaged in by participants along with either editing in the RWT text editor box (code category E) or editing in a separate Word document (code category J). A close examination of the HJHJHJ sequence illustrated in Figure 5.1-3 revealed Participant 8 to be using knowledge accessed in his concordancer searches for Step examples (found in the Demonstration Module) to improve his draft as he made revisions to the text in a Word document. Observations from the screen captures of other participants (P1, P3, and P4) revealed the interaction sequence HEHEHE, representing learners' accessing of the Demonstration Module and applying their new understanding of section structure or functions and linguistic features of particular Steps as they edited their text in the RWT text editor box. The HEHE sequence occurred more commonly among the RWT users than HJHJ, though Participant 8, who accessed the Demonstration Module then edited in his Word document, frequently saved the changes made to his new draft.

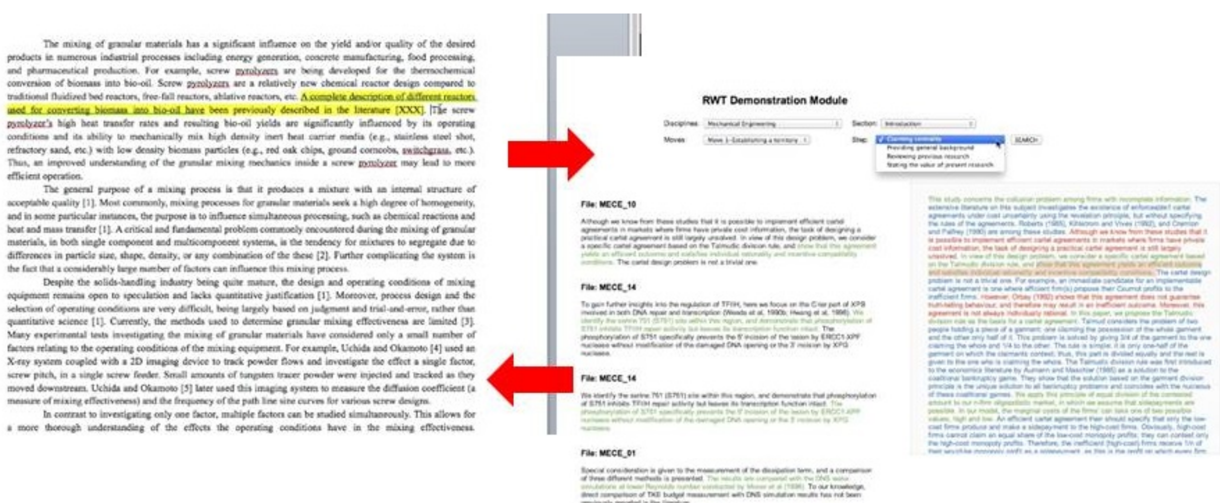


*Figure 5.1-3.*Demonstration Module accessing and text editing sequence in RWT interactions

Another feature of the sequence analysis data which stands out is what interaction was engaged in first when the participants initially received feedback from the RWT analyzer (when the screen captured recording began). As revealed by the first color-coded block in the interaction sequence strands in Table 5.1-7, as soon as they received feedback on their submitted draft, most learners proceeded to one of two areas on the RWT Analysis Module page: Move-level feedback displayed in the Move summary feedback and range bars shown on the right side of the page in section label “Analysis” or the “Your article” box to the left which displayed the RWT’s feedback on each sentence of the draft as color-coded by Move. Five of the 11 total participants, Participants 1, 5, 6, 8, and 11, all proceeded directly to their color-coded draft (as indicated by the dark green color block at the start of their sequence strands in Table 5.1-7 above) upon first receiving feedback from the RWT analyzer. Four of the 11 learners, Participants 2, 3, 7, and 9, accessed the Move-level feedback (as indicated by the dark blue color block at the start of their sequence strands in Table 5.1-7) as soon as they received feedback on their draft. Only two learners diverged from this pattern: Participant 10 went directly to the Step-level feedback (as indicated by the light blue color block at the start of his sequence strand) and Participant 4 scrolled down immediately to view the pie chart feedback.

Not shown in the sequence analysis, but observed in the review of screen recording data and still pertinent to learner–RWT engagement was the use of side-by-side screens. At times in their recorded RWT interactions, the learners opened more than one internet browser or program window, minimized each embedded open window, and positioned the two windows side by side so content on both pages could be accessed simultaneously; Figure 5.1-4 represents a screen capture taken directly from one such authentic learner interaction.

Figure 5.1-4 shows Participant 5 taking notes in a Microsoft Word document (in the screen to the right) while also accessing her individualized draft feedback in the Analysis Module (in the screen to the left). Later in the recorded interaction, Participant 5 also opened the Demonstration Module and searched for Step examples; during this interaction, the learner positioned a browser opened to the Demonstration Module beside her Word document as she took notes and even copied down examples of particular Steps in her discipline directly from the results generated by searches using the concordancing tool.

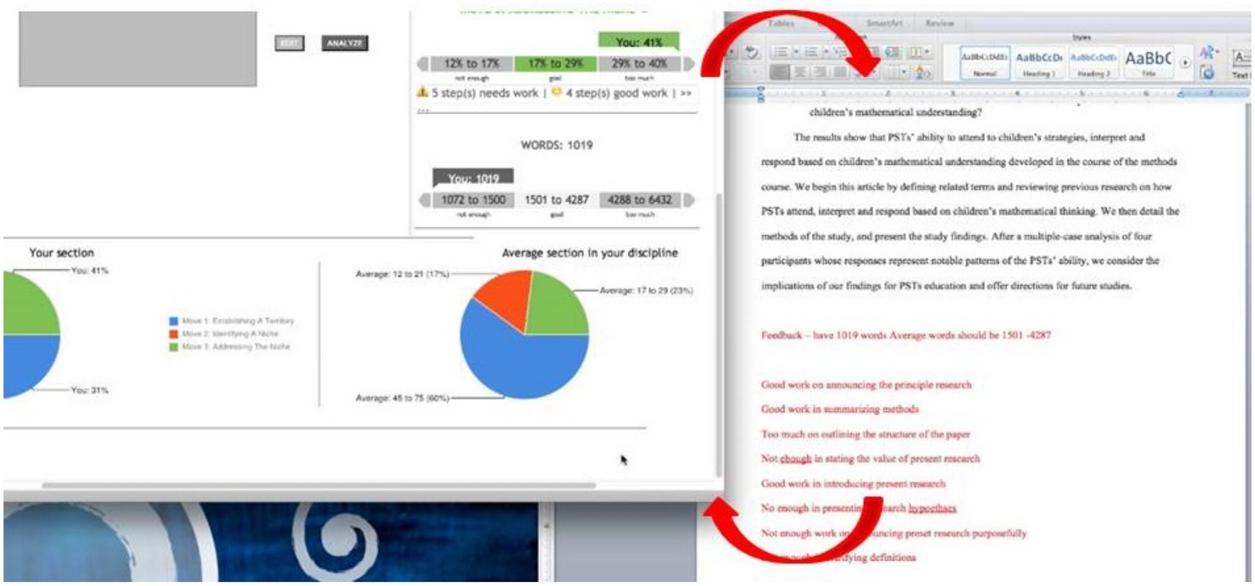


*Figure 5.1-4***.** Simultaneous use of two side-by-side windows

Participant 5 was not the only RWT user to utilize the dual screen setup to access both Analysis Module feedback or the Demonstration Module. Participants 1, 9, and 11 both kept open two screens (one of which was the Analysis Module) as they made changes to their section drafts (either in a Word document or using the RWT's text editor function). Like Participant 5, Participant 3 also arranged two windows side by side as he accessed examples in the Demonstration Module and made changes to his draft in the RWT's text editor. A joint discussion of these interactions and other interaction sequences along with results from the time-on-task analysis follows in the combined sequence and time-on-task analysis section.

Time-on-task analysis results. The time-on-task analysis of the screen captures revealed trends in how groups and some individual participants allocated their RWT interaction time to specific tasks during their draft revision. The same interaction categories used in the sequence analysis were employed to systematically analyze the time users spent interacting with certain RWT features.

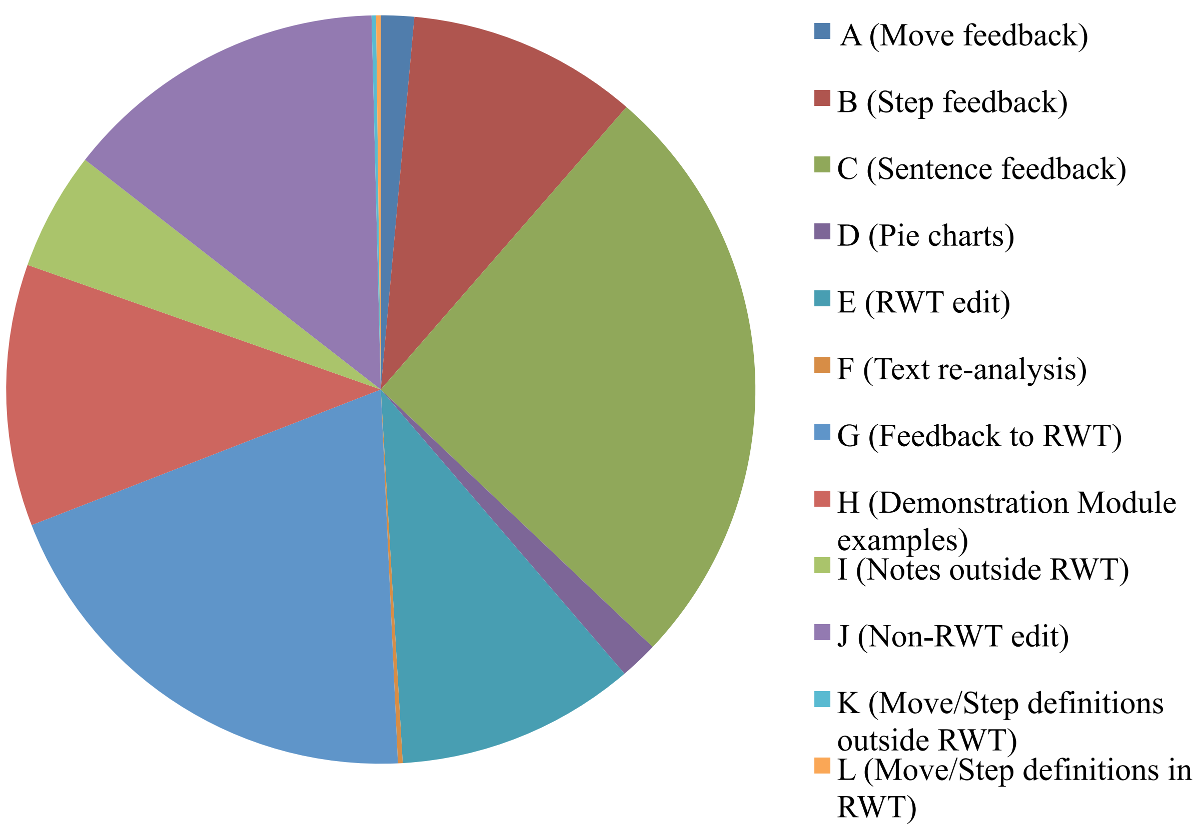


Figure 5.1-5. Pie chart showing overall distribution of group's combined time spent engaging in each interaction

Figure 5.1-5 is a pie chart displaying the proportion of time spent on each interaction category task tallied by group totals. Whereas Figure 5.1-5 shows the percentage of time the entire group of learners spent interacting in each RWT interaction category, Table 5.1-8 provides the numerical breakdown of the totals for each code category by seconds spent in each code category. From both the Table and the corresponding figure, we can observe that participants spent most of their recorded RWT interactions engaging in accessing sentence-level feedback in the colored text (code category C) and providing feedback to the RWT by interacting with the thumbs indicators or commenting on particular sentences (code category G). The participant group spent the most time (8,497 seconds) interacting with their analyzed, color-coded drafts, and the second greatest amount of time giving feedback on sentences (6,559 seconds).

Also evident from the table showing group totals are other interaction categories where learners spent much time during the draft revision. From the Table 5.1-8, it is clear that participants, as a whole, spent a great deal of time editing their draft in an external document (code category J), editing in the RWT text editor (code category E), and interacting with Step-level feedback from the drop-down menu showing both the "good work" and "needs work" suggestions for draft improvement of incorporation of each Step (code category B). Those interaction categories participants spent the least amount of time in were: accessing Move and Step definitions in the RWT (code category L) or external documents (code category K), and re-analyzing drafts in the RWT Analysis Module (code category F).

The total number of seconds for time spent in interactions in each of these interaction categories was roughly slightly over a minute for the entire group (64 seconds in K, 66 seconds in L, and 68 seconds in F). It should be noted that learners' re-submission of their drafts for subsequent RWT analysis lasted approximately two seconds each, but was still included in both

Table 5.1-8

Group Totals for Time On Task (RWT Interaction Activity by Code Category)

	A	B	C	D	E	F	G	H	I	J	K	L
Time on task	473	3293	8497	547	3421	68	6559	3739	1693	4660	64	66

Note: Time totals are in seconds

Table 5.1-9

Participant Totals for Time On Task (RWT Interaction Activity by Code Category)

Participants	A	B	C	D	E	F	G	H	I	J	K	L	Total
P1	0	194	247	12	1026	4	1200	153	0	193	64	0	3093
P2	97	509	382	76	263	8	594	150	0	0	0	0	2079
P3	74	30	1854	28	522	6	719	218	0	0	0	0	3451
P4	6	446	690	70	966	36	399	314	0	266	0	49	3242
P5	6	299	893	86	5	2	118	216	1167	408	0	0	3200
P6	44	275	1018	8	339	4	1068	468	0	0	0	0	3224
P7	7	423	589	14	292	4	738	217	0	0	0	0	2284
P8	88	325	780	93	6	2	602	599	526	385	0	17	3423
P9	42	352	657	41	0	0	506	975	0	0	0	0	2573
P10	47	53	537	55	2	2	501	295	0	1750	0	0	3242
P11	62	387	850	64	0	0	114	134	0	1658	0	0	3269
Totals	473	3293	8497	547	3421	68	6559	3739	1693	4660	64	66	

Note: Time totals are in seconds

the sequence and time-on-task analyses, as the number reveals total re- submissions as well as facilitates an understanding of when re-submission of drafts commonly occurred in learners RWT interaction and along with, preceding, or following, which other interactions.

While Table 5.1-8 displays the group totals for seconds spent in each interaction category, Table 5.1-9 shows a breakdown of the total number of seconds each participant spent engaging in each coded interaction in their RWT draft revision. Another means of deciphering the numerical data shown in Table 5.1-9 is provided in Figure 5.1-6 where individual totals for time on task are shown in graphic form; in the figure, each interaction category is represented by a different color in the participants' individual totaled seconds spent on interactions.

Figure 5.1-6 allows perhaps a more succinct way of seeing what activities participants spent the most or least amount of time doing during their recorded RWT interaction (indicated by the length of the color code category in each participants' interaction column) as well as individual participants' total interaction time within the categories. Along the X axis, each column corresponds to the 11 participants' individual RWT interactions by color-coded category while the Y axis shows the number of total seconds spent on each activity.

What is clear from Table 5.1-9 and the corresponding chart in Figure 5.1-6 is the variation in the total length of time learners interacted with the RWT in the specified interaction categories. As the "Total" column in the table shows, Participant 2 spent the least amount of time interacting with the RWT, with 2,079 total seconds of recorded interaction in the 12 code categories. Participant 7 also spent less time than most other learners interacting in the interaction categories, with 2,284 total seconds of recorded category-specific interaction. By contrast, Participants 3 (with 3,451 total seconds) and 8 (with 3,423 total

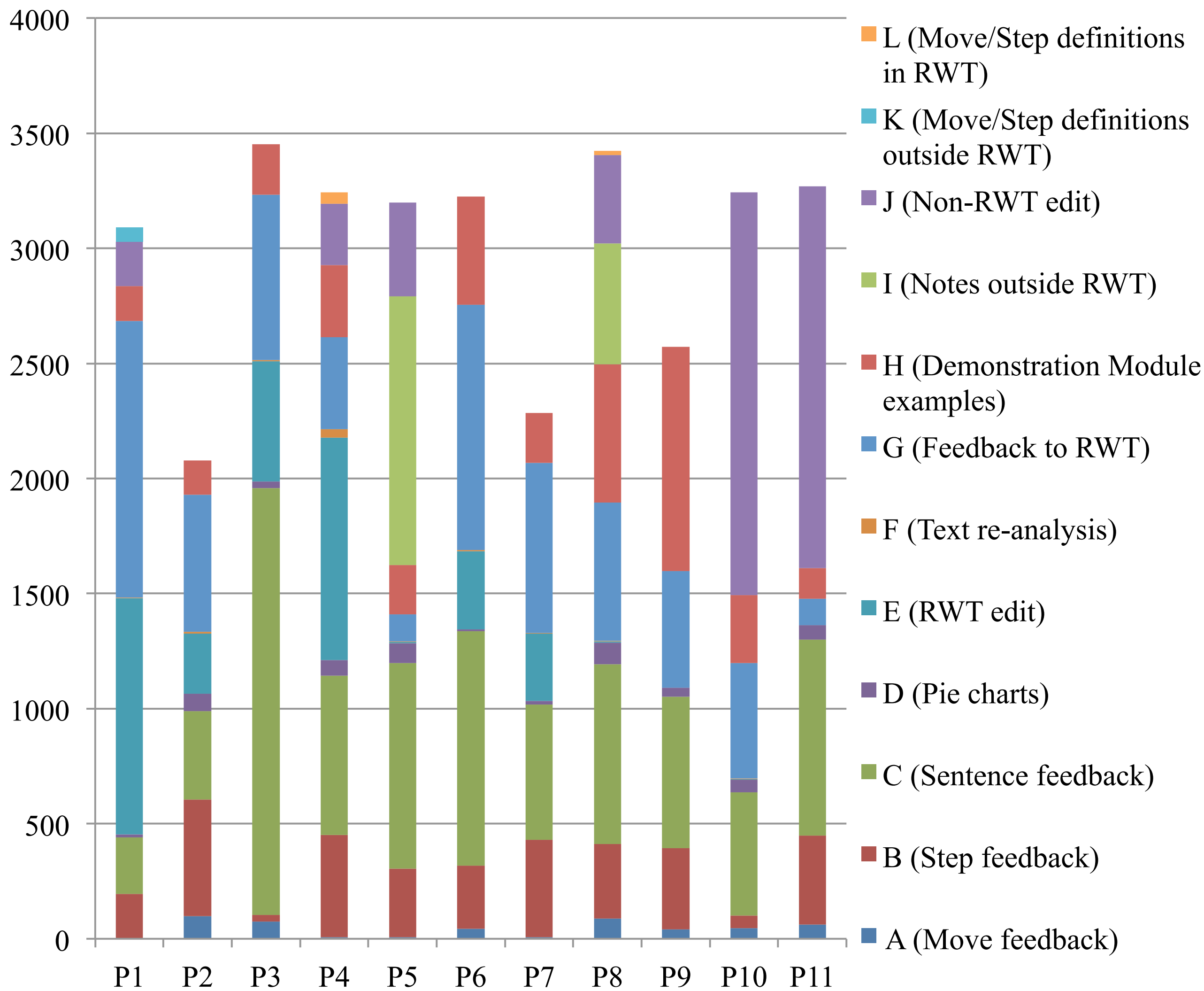


Figure 5.1-6. Distribution of time on task (interaction code category) by participant

seconds) logged the most number of seconds among the 11 participants in their interaction with the code categories. This disparity in the total length of time for each participants' interactions means that during the recorded RWT interaction (approximately 55 minutes), some learners were likely more inactive on their computer screens than others, as recording was paused when mouse inactivity occurred longer than 30 seconds. Attention diverted away from the RWT for lengthened periods of time could have been a result of learners interacting with a paper-based copy of their section draft, taking notes on paper, interacting with their classmates or the instructor, or leaving their computer for a short break. The varied total interaction times may also signify that some learners simply took longer to initially access the RWT homepage and log in with their user ID, locate, then copy and paste their text into the RWT for the initial analysis, or find and access materials on their computer or flash drive or on the class's course management system website.

Also evident from the table and related figure are what activities all learners engaged in, and which interactions few learners accomplished. It is clear that participants spent much time providing feedback to the RWT (code category G); at first glance, this finding may seem in apparent opposition to an earlier reported finding from the analysis of the RWT database data which showed that participants did not click frequently on RWT functions to provide feedback to the RWT analyzer. However, a closer analysis of the screen capture data reveals that RWT users did indeed spend much time providing feedback to the RWT. The comparison of data and intense examination of the screen captures reveals that the RWT database only recorded users' clicks on thumb markers, which indicated learners' agreement, disagreement, or partial agreement with their sentence-level feedback. The recorded data in the RWT database did *not*, however, account for the text-based comments learners provided in the text box below the thumbs markers. It was in this text box where learners commonly justified their rhetorical intentions or signaled the Step or Move they were aiming to accomplish. Because the time-on-task analysis considered learners interactions with the [dis]agreement markers (thumbs markers) *and* their written comments to the RWT as providing feedback to the RWT, this discrepancy is resolved. Because what initially seemed an inconsistency in the data was clarified by more intensified inspection of learners; video recorded screen captures, it was thus critical that this study explored user interactions with the RWT using a variety of data sources and applying varied analytic techniques.

Participants also spent long amounts of time interacting with sentence-level feedback (code category C); as it was observed in earlier noted group summaries showing the group's considerable interaction in these two categories, it seems that individual patterns reflect the overall group trends for heavy interaction with the color-coded sentences in the students' analyzed draft and feedback functions.

Also apparent from Table 5.1-9 and Figure 5.1-6 is the emphasis on editing of the draft. All participants in the group spent a good portion of their RWT interaction time on editing in some form. This editing was accomplished in both the RWT text editor box (code category E) and in an external (non-RWT) Microsoft Word document (code category J). All but two participants (P9 and P11) made some sort of revisions in the RWT's text editor, with Participants 1 and 4 interacting with this feature for the greatest amount of time. Interestingly, Participants 1 and 4 were also the only participants to use both the RWT text editor and a Word document to edit their drafts. Participants 1, 4, 5, 8, 10 and 11 edited in their own Word document, with Participants 10 and 11 expending the most amount of time editing in the external document.

Figure 5.1-6 likewise reveals that individual participants tended to spend more time on some interaction categories than others, suggesting more time was spent in fewer interactions as opposed to more equal time spent on all or many interactions. Participant 5, for example, spent much time taking notes in non-RWT computer-based documents (code category I), whereas most participants did not engage in this activity at all. Also, it seems Participant 3 spent the majority of his RWT interaction time accessing and clicking on his color-coded sentences which had been analyzed by the RWT analyzer (code category C). As seen in the figure, a color-coded portion representing code category F (re-analyzing the text in the RWT) is only visible for Participant 4's interaction column, not unexpected considering this is the learner who submitted 18 drafts to the RWT for re-analysis and thus spent the most amount of time re-submitting her new drafts to the RWT analyzer.

What the time-on-task analysis so far has not yet revealed, but as was exposed in the observation of screen captures, is participants' increased attention to the "needs work" portion of the Step-level feedback. Figure 5.1-7 provides a screen capture from one learner's (Participant 2's) RWT interaction in which much attention was given to RWT Step-level feedback where the analyzer indicated the student had "not enough" representation of a particular Step in her draft.

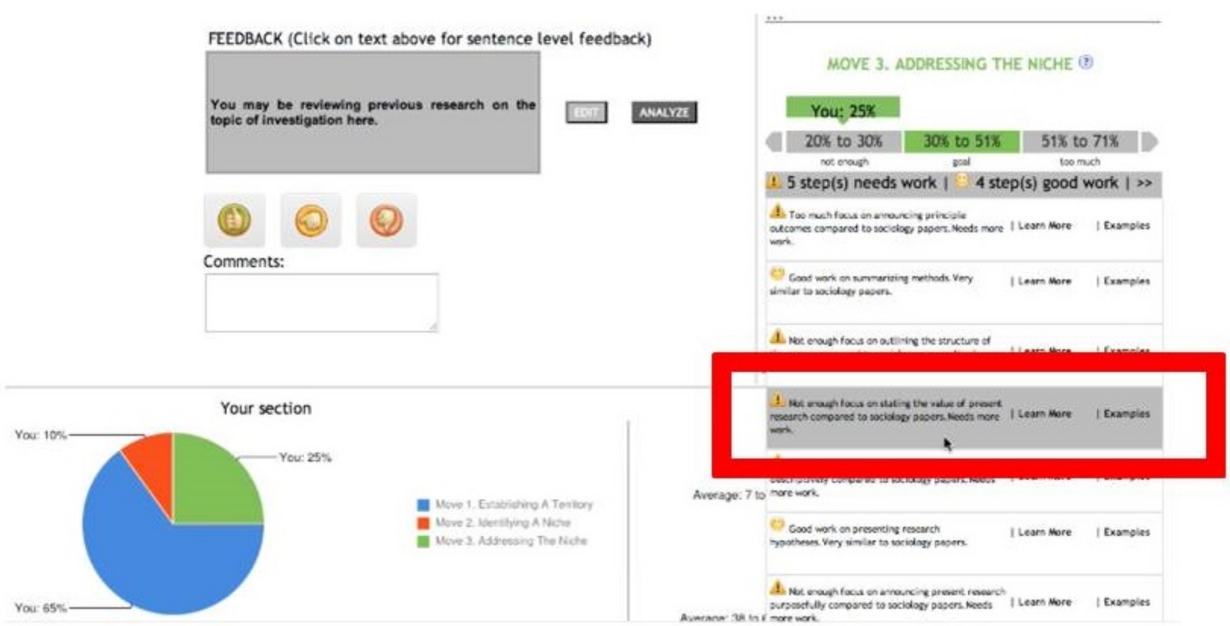


Figure 5.1-7. Screen capture depicting intensified focus on Needs Work areas

In general, the screen capture observations showed that when participants were interacting with Step-level feedback, they tended to hover over and click on the Steps the

RWT had designated as “needing work.” This included Steps shown to have “not enough” and “too much” presence in the students’ analyzed section draft as compared to average Introduction sections in published research articles in their fields. In particular, screen captures from Participants 2 and 7 showed that the learners focused significant attention on the “not enough” Step-level feedback. Participant 4’s recorded interaction included repeated inspection of both the “not enough” and “too much” Step feedback interspersed with editing of her Introduction section draft. The following combined analysis of the sequence and time spent on particular RWT interaction categories may help elucidate individual and group RWT interaction behaviors.

Combined sequence and time analysis. A joint discussion of both the interaction sequence and time spent in specified interaction categories reveals even more similarities and differences in learners’ individual behaviors using the RWT. Figure 5.1-8 illustrates variations in the amount of time participants spent on the designated interactions by the amount of seconds (shown along the Y axis). Variability between the height of peaks per participant reveals the sharp disparities between participants’ RWT interactions in terms of time spent on individual interaction categories.

Just as Table 5.1-8 and Figure 5.1-5 showed, Figure 5.1-8 also demonstrates that participants generally spent most of their recorded RWT interactions engaging in accessing sentence-level feedback in the color-coded draft (code category C) and providing feedback to the RWT (code category G). Considering the time spent on these interaction categories in combination with the sequence interaction strands shown in Table 5.1-7, it becomes clear the

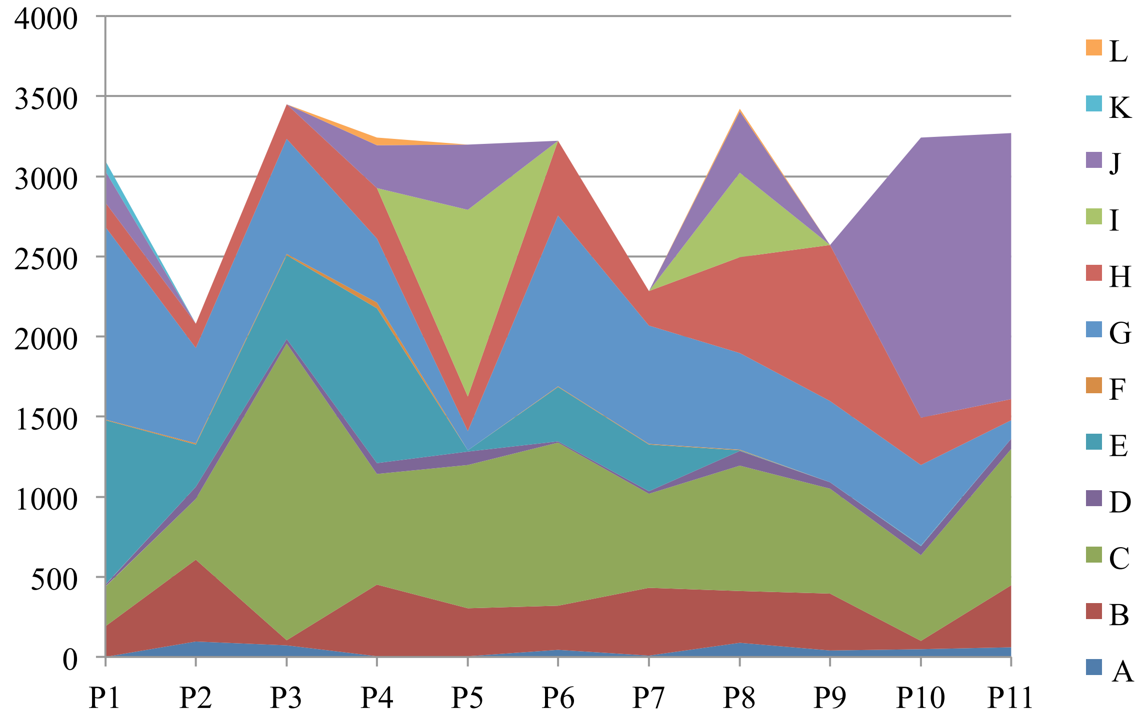


Figure 5.1-8. Comparison of participants' individual time spent on RWT interactions

code categories of C (in red) and G (in purple) also occur in a back-and-forth manner. This implies that not only did the participants engage most in accessing sentence-level feedback and providing feedback to the RWT, but accomplished these interactions one after the other.

Figure 5.1-9 shows a screen capture of one participant's (P10's) back-and-forth interaction between sentence-level feedback in the RWT-analyzed text and the comment/feedback functions. This interactional pattern (between code categories C and G) occurred commonly among the learners. One reason why participants interacted back and forth with the color-coded sentence-level feedback and comment/feedback function may be because they were aiming to justify the rhetorical intent of their sentences as they provided feedback to the analyzer. To perform this justification, the participants sometimes required clarification of their understanding of the Moves or Steps, visible in Participants 1, 2, 6 and 7's return to the Move or Step definitions.

Figure 5.1-9. Screen capture depicting students' back-and-forth interaction with sentence-level feedback in the RWT-analyzed text and comment/feedback functions

Checking Move and Step definitions to confirm their understanding of the rhetorical functions and then re-examining their texts to verify their intended meaning in the sentences is a process Grimes and Warschauer (2006) and Yang (2004) recognize as a positive consequence of language learners' interaction with automated feedback. The formulaic or predicted nature of AWE feedback may serve to engage writers in close inspection and dissection of their writing. Thus, defending their interpretations of rhetorical functions for their sentences' — in providing feedback to the RWT—impelled participants to return to their drafts, closely examine their sentences, and decide if their intended meaning was being effectively conveyed.

Another finding revealed in the combined sequence and time-on-task analysis is that participants spent differing lengths of time on particular features, and engaged, to varying degrees, in bouncing back and forth between different RWT features. For example, by viewing her interaction sequence strand in Table 5.1-7 and the time spent on specified interactions in Figure 5.1-8, it is evident that Participant 5 spent longer amounts of time on each feature and did not jump around frequently between different RWT features. By contrast, examination of the same table and figure together reveal that Participant 4 engaged in much back-and-forth switching between differing features of the tool, spending little time on each in her sequence progression. As can be recalled, Participant 4 also had the longest interaction sequence strand, indicating a great deal of shifting between RWT interaction categories.

Learners' concerted attention to the Steps that "need work," whether there was "too much" or "not enough" of the particular Step in the users' drafts, denotes their desire to attend to problematic aspects of their writing and to conform their writing to that which is more representative of published writing in their disciplines. As Cotos (2011) found in her exploration of language learners' use of IADE, the AWE tool on which RWT was founded, the automated feedback prompted students' noticing of features and alertness to discourse forms, both of which led to enhanced rhetorical quality of the writers' texts. Study participants' increased attention to the "needs work" areas of the RWT feedback suggests the writers' interest in and attempts to resolve what the RWT discerned as potential problem areas in the drafts. This served as the first step in engaging writers in revisions to enhance their rhetorical effectiveness, pointing once again to a successful accomplishment of a primary goal of the RWT.

The variability among learner interactions shown in the sequence strand and time-on-task analyses demonstrates the freedom learners had as they used the RWT for draft revision. Learner autonomy, what Benson (2001) calls "a precondition for effective learning" with learning technologies (p. 1), was evidenced in a number of learner–RWT interactions. One of these interactional choices was manifested in participants' preferences for certain venues for editing and saving their texts and taking notes using non-RWT computer-based programs. Some participants preferred to revise their drafts in Microsoft Word instead of the RWT text editor, perhaps for fear of losing the draft revisions or a lack of recognition they could access the drafts later or export the new drafts to external documents outside of the RWT. Some participants also chose to take notes in Microsoft Word, possibly implying their interest in saving their individualized feedback or, again, an uncertainty of whether they could access the RWT outside of class. Study participants not only had the choice of what and how RWT features were accessed, but also at what self-determined pace they wished to process the feedback and address draft revisions, provisions Warschauer and Grimes (2008) identify as variables in promoting autonomous learning. The pace, sequencing, and distinctive ways in which participants interacted with the RWT features enabled them to control their own draft revision experience, placing the responsibility of genre learning in the learners' hands (Cotterall, 2000).

Yet another aspect of learner autonomy afforded in users' controlling their own RWT draft revision is the positive impact autonomous learning has on teachers' in-class time management. When students are engrossed in draft revisions using AWE programs, writing instructors become available to offer more in-class one-on-one assistance to students requiring additional support with their writing (Warschauer & Grimes, 2008). Teachers wishing to integrate the RWT or like AWE tools into their writing instruction may find the tool advantageous in its allowance for additional time for the instructor to attend to specific needs of students requiring extra in-class attention.

In addition to revealing potential behavioral patterns in learners' interactions with the RWT, the sequence strand analysis further presents a unique advantage in its ability to expose what features RWT users interact with first upon initial engagement with the tool. For example, some learners proceeded directly to the color-coded text, perhaps because their own compositions were the most recognizable part of the tool. Others commenced their RWT experience by first accessing Move-level feedback, potentially because this feedback was displayed in a clear range bar and displayed highlighted percentages along with the indicator "goal." Because this study involved language learners using the RWT for the first time, witnessing which program features they accessed first is helpful in determining what improvements could be made to the tool's interface to make feedback more comprehensible and easily accessible (Nielsen, 2012).

Why different learners spent varying amounts of time interacting with different RWT features may be illuminated by applying an interdisciplinary model for exploring technology users' interactions in computer interfaces. The theory of *information foraging*, an ecological-cognitive framework for analyzing users' strategic information consumption per cost (time or energy) expended, was developed by cognitive psychologist Peter Pirolli (1997; Pirolli & Card, 1995, 1999) with the aims of understanding technology users' strategies for gathering and making sense of available information. Information foraging theory draws heavily on the behavioral ecology theory of optimal foraging, which asserts that animals forage for sustenance in ways that enable them to maximize their net energy intake per unit of time (MacArthur & Pianka, 1966). As an animal's survival and reproductive success are dependent on energy intake, the animal must adapt to optimize its rate of caloric consumption, adopting behaviors for locating, capturing, and consuming food with the most calories in the least amount of time possible (Kamil, Krebs, & Pulliam, 1987). Because various food types, all yielding different amounts of net energy, are scattered throughout a given habitat, an organism must evolve strategies for maximizing energy returns per energy expended. Thus, the optimal forager is one that considers the costs of hunting for its food and develops successful strategies for maximizing its "energetic profitability" given its environmental parameters (Kamil et al., 1987).

Pirolli (1997) applied optimal foraging theory's foundational concept of energy maximization to a heuristic for exploring technology users' hunt for relevant information given time and resource constraints. Just as no predator eats every prey available, no technology user consumes every information resource she comes across; instead she develops strategies for evaluating the profitability of encountered resources per access cost, prevalence, and handling time. Similar to animals foraging for food in the natural world, humans navigating information-dense physical and virtual spaces recognize that high-yield patches of relevant information are scarce. To locate those high-yield patches, technology users often engage in what Pirolli (1997) calls *scent-following*, or trailing proximal signals, such as bibliographic citations, internet links, or symbols representing the desired knowledge, that lead to the information of interest. When the *information scent* is acute, the forager makes intentional moves in pursuit of the anticipated information payoff. However, when there is no scent whatsoever, the forager may wander, searching haphazardly in the information repository (Pirolli & Card, 1999). Upon finding the appropriate information, its profitability is determined as the worth of the information obtained per effort expended to acquire the source, and a strategy may be developed for tracking down similar information in the future. Foraging decisions are thus made in order to optimize a payoff. This does not imply that information foragers will necessarily adopt only one profitable strategy when an implemented foraging decision proves successful. Instead, developing optimal foraging behavior involves dynamic adaptation and is influenced by continual deliberations on the presented problem, available currency, and potential constraints.

Pirolli's depiction of the technology user as a forager of information could be applied to findings from this dissertation if we conceptualize learners' initial interaction with the RWT for draft revision as a process of strategy development for locating and exploiting high-yield patches of relevant information (automated feedback, concordancer examples, etc.). As is clear from the analyses of screen capture data, learners spent varying amounts of time interacting with RWT features, interacted in differing back-and-forth patterns with the RWT functions, concentrated for extended periods of time on some RWT feedback sources, and rarely or never interacted with other functions. Study participants' unique RWT interactions, as revealed through both the sequence and time-on-task analyses, can be interpreted as individualized strategies for searching for, handling, and evaluating various feedback sources offered by the RWT in ways that guarantee optimal payoff.

An example scenario may further help illustrate the application of this model to a learner's first-time use of the RWT for draft revision. A presented information foraging problem for the learner could be whether to spend time processing Step-level feedback provided in the clickable sentences in the text editor box or to peruse the frequency comparisons of Move distributions in the student's text and other published texts in the respective discipline. The available currency in this situation would be the value of the particular RWT feedback, and the constraints, which delimit the relationship between the problem and the currency, could be the draft revision assignment specified by the teacher, the RWT interface usability, or even the computer literacy of the learner. This example circumstance shows how exploring users' interaction from an optimization standpoint may bring to light important questions about how RWT users make the decisions they do in their search for the most valuable feedback for draft revision.

Pirolli's (1997) *adaptation analysis* provides yet another illustrative means for characterizing the observed variations in users' RWT interactions. Adaptation analysis attempts to explain the behavioral adaptations of an organism based on the changing value/cost structure. The value of the feedback is not the only variable RWT users must take into account; resource costs and opportunity costs must also be considered. To a first-time RWT user, resource costs are the time or energy expenses that are incurred by the selected path for obtaining draft feedback. Opportunity costs are the benefits that *could be* reaped by accessing different feedback, but which are sacrificed when the current feedback path is selected. It is natural that learners' feedback consumption behaviors will recurrently adapt in constant consideration of the value/cost structure. Because the RWT interface is not rigid, users hold the power to change their feedback consumption as they see fit. According to Pirolli's adaptation analysis, RWT users optimize their feedback intake by accessing what they deem are the most profitable items (presumably the feedback that will offer learners the most assistance in their draft revision). In other words, learners will adapt their interactions to make the most of their information return (useful, individualized feedback) per resource (time or energy) expended when they are provided the chance to cultivate enriched foraging strategies through hands-on training (Pirolli & Card,1999). Researching how to best facilitate such learning experiences during learners' first-time use of the RWT may present practical suggestions for improving draft revision tasks or enhancing the RWT interface design.

Qualitative Analysis for RQ2a

Analysis of researcher & teacher observations. Results from an inductive analysis of the transcripts from the interview with the class teacher and on observational notes taken by the researcher during learners' interaction with the RWT provide a more thorough picture of the participants' behaviors while revising their drafts. The following report from findings of the qualitative data analysis includes a description of the codes that emerged from the researcher and instructors' observational reports and includes a recall of observable learner behaviors in general and specific instances. A discussion of what the codes mean and how they may be explained in terms of the literature on learners' interactions with CALL systems is provided after the report of codes.

Using feedback to re-examine rhetorical intentions. In the instructor interview, the teacher mentioned noticing participants using the RWT to reflect on their rhetorical intentions in their sentences, noting it seemed that "They interacted with the feedback at a cognitive level, so they really thought about it. And maybe, because I made it explicitly clear from the very beginning that that interaction feature is meant to make them think twice … but it seems like they were all doing that." The RWT users also seemed not just to rethink their rhetorical intentions, but also recognize the multi-functionality of the text, with the instructor stating, "They were realizing that they were doing perhaps multiple things in their sentences." The instructor also witnessed cognitive engagement as students examined the feedback and thought about what it meant; "That was like that, here and typing and then thinking and then typing."

Focusing on "fixing" the text. The observational notes revealed participants' assertions that they were attempting to "fix" their draft. At one point during the observation, Participant 1 turned to the researcher and announced, "I fixed the two problems, so I have good data for you!" then pointed to the pie chart on her screen which showed the distribution of Moves in her draft. This quote and the action following it implies the learner may have believed a goal of her RWT interaction was to address all the issues raised by the Analysis Module feedback and "fix" the text so that the distribution of Moves in her draft matched the Move distribution in Introduction sections in published articles in her field. Another participant, Participant 8, was also overheard saying, "I'm fixing errors. Already fixed one thing, now I'm working on another." From this statement, it can be perceived that the learner comprehended the RWT feedback to be alerting him to the "errors" in his draft and, presumably, that he perceived his goal was to "fix" them.

Providing feedback to analyzer. The researcher also observed learners providing much feedback to the RWT analyzer in the comment box as learners' clicked on individual sentences. Participants 1, 8 and 10 wrote comments to the analyzer and wondered aloud if their comments were being saved; this suggests learners were attempting to ensure their thoughtfully provided input about whether they believed the RWT Analysis Module feedback to be accurately picking up on their intended rhetorical meaning was being saved by the system. This desire to have their feedback saved also may point to participants' desire to help improve the RWT analyzer by providing it more accurate feedback on their intended rhetorical meaning for the sentences.

Not exploring all tool capabilities. The researcher's observational notes also suggest that participants may not have been aware of, and therefore failed to access, all of the RWT features. For example, the notes show that Participant 11 was not aware of, nor had he yet explored, examples in the concordancer before the instructor came over to check on him during class. In other words, the learner was not aware an entire module of the RWT, the Demonstration Module, existed. The instructor interview confirmed that the students may not have been aware of the plethora of capabilities or features of the RWT tool, stating, "And I think they still might not have used the full potential of the tool, because of the very limited introduction to the tool." The instructor followed up her worry that the full potential of the RWT was not exploited with an optimistic comment, remarking, "But I'm also hoping that, you know, this is not a one-time thing. It was the first time they were introduced to the tool, and then they had time to work with it at home." Thus, though not all aspects of the RWT were noticed or explored by participants, the instructor was still hopeful the students would expand their knowledge and use of the tool for draft revision in the future.

Working independently. The observational notes and instructor interview touch on two different observed RWT interaction behaviors among the class: independent working and collaborative working. Both the researcher and instructor noticed students primarily working by themselves with the RWT tool, with the instructor noting "I think most of them were working independently." However, others worked in pairs, or at least communicated with one another frequently during their draft revision.

Collaborating with classmates. From the observational notes, it is clear some participants were working together to understand how to use the RWT or to interpret what specific feedback meant. Participant 9 communicated much with Participant 10, with the nature of this communication mostly revolving around asking and answering questions about the use of the tool it what seemed like an attempt to understand the tool's functioning in a collaborative way. Participant 6 also collaborated a great deal with Participant 7, communicating throughout the class period to, what seemed from the observer's standpoint, understand the meaning of the feedback.

Editing in RWT text editor. The observational notes also showed that learners made substantial revisions or edits to their text in the RWT text editor box. Participants 1 and 8 especially seemed to be making considerable revisions to their drafts in the text editor box. Participant 1 spent a lot of time trying to make her language clear enough that it was understandable to the analyzer, because she was uncertain about how the analyzer was unable to recognize the Step she was intending to accomplish, remarking to the instructor, "I wish there was a way I could change the step to what it is I am actually doing, …so the feedback could change to all smileys and pie chart be more accurate." This comment makes it seem the editing P1 was doing was being accomplished to somehow appease the RWT so the learner could receive "all smileys," which indicate "good work" including particular Steps in the draft, and have the pie chart Move distribution in her own text match more closely with the pie chart showing Move distribution in published texts in her discipline.

Editing in a separate document. Draft revision was also accomplished in a document separate from the RWT's text editor box. The researcher/observer noticed a number of participants modifying their drafts in their original Microsoft Word document instead of in the RWT's text editor component. Participant 5 was making changes to her draft in her own Word document, highlighting in red the new edits she made as she went through the draft. Also, Participant 11 did editing in his Word document instead of the RWT text editor, then continued to return to the Word document numerous times throughout the rest of his RWT interaction, making changes to his draft then checking the RWT feedback in a back-and-forth fashion. While Participant 1 made revisions to her draft in the RWT text editor, at the end of the class she copied and pasted the changes she made in her text into a Word document to save for later.

Recording feedback in separate document. In addition to learners making changes to their draft in a computer-based program separate from the RWT's text editor box, the observational notes show that some learners were recording the RWT feedback on their analyzed draft in other places, both in separate Word documents or on a piece of paper. Participant 5, for instance, systematically copied down the RWT feedback, Step by Step, in a separate Word document, even making sure to color code the feedback (both "needs work" feedback for improvement and "good work" feedback) to match to the Move-oriented colors (Move 1 feedback in blue text, and so on). Participant 9, however, took a paper-based notebook from her backpack in the middle of her RWT interaction and wrote down Step and Move-level feedback with in with pen and paper in this notebook.

In her interview, the instructor noted that Participant 5 as well as Participant 2 took notes on the RWT feedback, saying "[Participant 5] was writing it down, and then [Participant 2] was writing it down. And again maybe that was because they didn't really realize that it's going to be there for them." In this comment, the instructor supposes that one reason why the learners recorded notes in a separate document was because they may have been unaware that the RWT would be accessible to them after class, or perhaps that, even if the tool were accessible, it may not save their draft-specific feedback.

Exploiting Demonstration Module. In the instructor interview, the teacher made observations about participants making use of the Demonstration Module. When discussing Participant 7's RWT interaction, the instructor observed, "She was using the corpus, the concordancer there quite a bit. So it's not like it was a question, but I just noticed that she was making use of that other support option or help option." The instructor also detected a possible trend in who may have used the Demonstration Module more; "I did notice that the nonnative speakers made more use of the concordancer than the native speakers, and I'm not saying that that's the case. But as I was walking around, I saw nonnative speakers using that more than the native speakers. So that's an assumption. I don't know." A return to the analysis of user interaction data showed there to be no significant relationships between learners' NS or NNS status and their exploration of or exploitation of examples in the Demonstration Module.

Exploiting the pie charts/graphical displays. The instructor also perceived learners' interest in the RWT's graphical displays of feedback in the form of pie charts. "Some of them kind of liked the idea of seeing the pie charts at the bottom. I guess it was a very clear way of comparing, you know, by those colors in the pie chart – here is where you are. I remember [Participant 2] was saying, 'Well, I know I don't have enough of that. I know I'm always going to be working on it.' " Not only did the instructor notice a trend among the class, but could also recall a specific instance when P2 used the pie charts to identify differences between the presence of Move 1 in her text and the presence of the Move in average Introduction sections in her field. In response to these observed differences, the learner recognized what she then needed to improve in her own draft.

Using dual browser windows. Another noteworthy observation from the researcher's notes involved some participants' use of two side-by-side browser windows as they interacted with the RWT. Participant 9 was observed to have opened and begun working in two browser windows later in her RWT interaction, while Participant 10 spent most of his time using dual browser windows, with the RWT Analysis Module open in one window and the concordancer in the Demonstration Module in another window.

Communicating with instructor about purpose of RWT. There were also a number of codes that included evidence of interactions based on participants' verbal reactions to the RWT. Many of these verbal codes involved communication with the instructor. The instructor spent much of her interview recalling how she spent much time during students' RWT interaction clarifying the purpose of the tool. When discussing how she helped Participant 8, the instructor mentioned "And I had to emphasize that that interaction was just to get their cognitive processing triggered and so that they think about what they are doing or either confirm, or if they cannot really confirm, then they should probably revise, modify and improve on their current expression." In clarifying the purpose of the RWT with Participant 3, the instructor recalled telling him, "Instead of anticipating and trying to figure out and solve the puzzle, why the machine is telling me this and how it could change, think about what is it that you are doing in that sentence instead; taking them back to thinking about how they expressed the idea rather than how the computer analyzes what they say." The instructor's clarification of the purpose, however, may have been triggered less by students' questions about the purpose and more by the instructor's desire to clarify the intended goal of use of the RWT.

Asking questions of instructor about how to use RWT. During the first 15 minutes of the learners' interaction with the RWT, participants asked lots of questions concerned with how to use the AWE program. As the observational notes show, Participant 9 had questions about both where to find and how to incorporate the Demonstration Module examples into her own writing, while Participant 3 was more interested with how he could modify his draft. Participants 5 and 7 needed much teacher assistance at the start of their RWT interaction, as they seemed unsure of how or where to begin. In her interview, the instructor also remembered the students trying to figure out features of the tool, asking "'What does that mean?' and 'Where could I go to do this?' or ' Where can I see that?' or 'If I click here, so where does the feedback go?' All that. Because they did have some questions now and then." The instructor also pointed to one specific incident when talking with Participant 6 who had asked about the pie chart feedback and the instructor clarified that it was the distribution of Moves, stating,

> So it was helpful for her to understand that those graphics are not like static. Those graphics might balance out if they start addressing 1, for instance, and add more to Move 1, more Steps and more content to develop those Steps. So there was that idea also, that the more you revise, that graphical feedback is likely to change, and the moves are going to fluctuate. (Instructor)

These quotes also reveal how the teacher's responses were not aimed at simply explaining how the RWT could be used, but also guiding the students towards taking action to improve their drafts.

Asking questions of instructor about providing feedback to RWT. Several students also asked the instructor how they could provide feedback to the RWT, especially when they disagreed with the sentence-level feedback about the rhetorical function being accomplished. From the observational notes, Participant 6 was witnessed asking the instructor, "If we don't agree, then…what do we do?" Participant 4 also disagreed with the feedback and remarked, "It thinks I am providing general information, but I am reviewing. What should I do to defend my intent?" Participant 1 was also concerned that the feedback she submitted to the analyzer was saved, asking the instructor "Wait, it saves for later, right?" Participant 3 had questions about "What kind of comments should we put in the feedback box?" and Participant 5 wondered how specifically to use the feedback function. The instructor also noticed the learners had questions about providing their own feedback to the RWT based on the sentence-level feedback, recalling her responses; "'Okay, so I'm writing this, but where is it going?' And I had to tell them, 'Well, that's in the article drafts in that left-hand menu.' " These questions show participants' concern for not only recognizing how to provide feedback to the RWT analyzer, but also a desire to "defend," as Participant 4 stated, their intended meaning.

Questioning the RWT functioning. The observational notes and instructor interview also revealed that students asked questions of the instructor about the RWT's functioning. "Why are the dashes deleted?" Participant 6 asked, and "I write a comment in the feedback comment, is it saved?" Participant 1 wondered. From the observational notes, it was also clear some participants were attempting to figure out the system, but also anticipate the RWT's response to the students' draft modifications. Participant 3, in particular, was seemingly trying to figure out how the RWT works so as to avoid getting inaccurate feedback. The instructor also noticed Participant 3 attempting to adapt to the system based on his understanding of how the system worked, commenting,

> It was an interesting comment that he made, like trying to adapt to the system. So trying to anticipate why the system is saying; "I think you're doing this here. You may be doing this here." So trying to think like the machine to anticipate and react to the machine's thinking. And I had to tell him that it's an interesting approach, but that's not, from a learning standpoint, that's not a helpful strategy. They're brilliant students, they are advanced in their degrees and some of them are engineering and some of them were really curious about "How does it do this analysis?" So I didn't really want to tell them that it's based on a lexical approach, because I didn't want them to sort of take a shortcut and experiment with language use only, you know, if I change a word, is it going to see better? (Instructor)

From this quote, we see the instructor believed Participant 3 to be trying to anticipate the system's reaction to the draft revision changes and adapt his text revision to elicit more accurate feedback (or perhaps feedback more in line with expectations from writing in his discipline) from the RWT. From the interview, the instructor also responded that students were more than just "curious" about the functioning of the system. When asked if there was curiosity about the RWT, the instructor responded,

> Yeah. Curiosity. And, well, since you mentioned curiosity, there was more than curiosity for some of them. Some of them, like [P8], for example – he was trying to… Well, one question he had was: "Now if I tell the tool [in response to the sentence to the sentence-level feedback] this is not what I'm doing, and then when it reanalyzes,

> if the change is to what I told it that I'm doing, how is it then reliably comparing to the field?" (Instructor)

These instructor comments reveal the instructor thought these "brilliant" graduate students, some of whom have backgrounds in machine learning and engineering, were going beyond simply understanding how to use the tool for improving their drafts, but also attempting to understand the backend computation behind the analysis and feedback generation.

Asking questions of instructor about RWT feedback accuracy. The observational notes also revealed that a number of learners asked questions of the instructor regarding the RWT feedback accuracy. While the first 15 minutes of students' RWT interaction consisted of many questions about how to use the RWT, the questions slowed and eventually mainly centered on confirmation from the instructor that the analyzer's feedback was not 100% accurate. Participant 7, in particular, spent much time with the instructor at the end of class asking about the accuracy of the RWT feedback. In the interview with the instructor, she also commented about her needing to explain to students about the accuracy of the RWT feedback, recalling that in her discussion with Participant 3, "I mentioned something about the accuracy of the tool, and I said that the accuracy is about 0.8, and he nodded, like that's pretty good for a tool like this, that's pretty good." Thus, participants were not only curious about the functioning and use of the tool, but also about the accuracy of the feedback they received on their draft.

Asking for clarification about Moves/Steps. Some of the learners' communication with the instructor during their RWT use involved the learner asking for clarification about the definitions of Moves and Steps in Introduction sections. The observational notes showed Participant 4 asking the instructor about the differences between the Steps "Providing general information" and "Referencing previous research"; in this case, it seemed the RWT analyzer was evaluating a sentence a certain way and Participant 4 wanted to know why, thinking the issue may be the learner's misunderstanding of the Steps. The instructor pointed to the fact that, while Participant 7 was having problems with her analysis, "In fact what was the problem was that she misunderstood the meaning of clarifying definitions in Move 3. So it was good that she sort of realized then, 'Oh, that's what it is. Yeah, that was my… I didn't understand it.'" The instructor then recognized that the students would likely uncover misunderstandings in their interpretations of Moves and Steps as they proceeded with RWT draft analysis, remarking "As they are thinking about things, they are likely to catch some problems in their own understanding of the functions of the steps, for example, right?" Yet the teacher was hopeful that the provided supplemental materials in the RWT would assist in clarifying students' misunderstanding of Moves and Steps if they were using the RWT on their own, stating "So they *do* have the resources, but still just the name of the Step, I guess, was a little bit confusing to her."

The instructor also observed that students benefitted from hearing her clarification of the Steps to other students in class, referring to Participants 6 and 7 as she mentioned, "I think when they were noticing something or hearing a comment or an explanation that was made to someone else, they were even looking at each other. But I think what triggered that is they were hearing my explanations to some questions or reactions to some questions." The instructor likewise felt a better training session would help resolve misunderstandings and answer some questions about RWT use, remarking "If we have a better learning, learn a training session, all these would have come up for everybody to hear, and so that would be good, too."

Making recommendations for RWT improvement. Some of participants' communication with the instructor included recommendations for the RWT tool's improvement, as unveiled in the researcher's observational notes. Participant 3, for example suggested "Maybe a 'save feedback key' would be helpful," and Participant 1 mentioned, "I wanted to make sure the feedback to the analyzer was being saved" so it could improve the functioning of the RWT. Both of these learners connected their input to the RWT to ways in which the RWT analyzer could be further improved.

Expressing excitement. In addition to learners communicating with the instructor to ask questions, clarify misunderstandings, or make suggestions for RWT improvement, a number of students also made evident the emotions they felt during their RWT interaction. In the observational notes, it was recorded that Participant 3 showed excitement, exclaiming "Yes!" when he modified a sentence and the RWT analyzer finally recognized his sentence as the Step he intended. The instructor also observed some participants' excitement about receiving particular feedback from the RWT, remarking "I had to clarify that the tool is only able to recognize one [function per sentence] at this point. And I think it was [Participant 6], and she was excited actually to hear that, 'Oh, so then it all makes sense. I can see it, seeing that.' "

Happiness was another emotion the instructor mentioned witnessing during participants' RWT interaction, recalling "And they were happy to realize that they were not necessarily wrong in their expression and that the tool is not completely off as well." These expressions imply the learners seemed to experience excitement or happiness when they either received feedback that was in line with their intended rhetorical meaning for a given sentence, or when they realized what they had written was not necessarily "wrong," but may have been interpreted differently by the analyzer.

Expressing anticipation about tool development. From the instructor interview, it was also clear that students were expressive about their anticipation that the RWT would be further developed. When referring to her communication with Participant 6 during the RWT interaction, the instructor recalled, "I gave her the idea that the feedback would be generated, like 'Uou may be doing this here, but you may be also doing that, depending on whether it has high probabilities for recognizing two steps in it.' So she was excited about that. She said that would be great." The instructor remembered not only Participant 6 being excited about the RWT's future improvement, but also Participant 8's anticipation, stating,

> And again I think it was [Participant 8] who was very excited about it. He actually was waiting for this tool to be used in class; because, before the class started, before the semester started, he came to see me to make sure that it is the right time for the class and if the class is a good fit for him. So I told him a little bit about the tool, and I showed him the tool and when… A couple classes before, he actually asked me, "When are we going to use that? You showed me that. I really want to see how that thing analyzes my writing." (Instructor)

In this statement, it is clear that Participant 8 expressed interest in using the tool, not only in the future, but also prior to his interaction with the RWT after he knew of its existence.

Expressing frustration. However, it was not only excitement or anticipation about the RWT's future improvement that participants expressed during their draft revision. The researcher's observational notes also showed that, while enthusiasm for the RWT was expressed, learners also communicated some frustration during their interaction with the

AWE program. Participant 8 noted aloud "It's frustrating, I don't know how it's picking up what it's picking up," expressing frustration that the RWT analyzer was not "picking up," or detecting, his intended rhetorical Step. Interestingly, this participant (P8) was the same who also expressed enthusiasm about the tool's improvement and completion, pointing to the fact that learners' experiences with the RWT were complex and involved not one, but possibly many emotions.

Expressing confusion. The observational notes also showed that some participants expressed confusion during the RWT interaction. From the beginning, it was evident Participant 9 was not certain what she should do if she disagreed with how the RWT analyzer analyzed her draft, for instance. Also, from the instructor interview it was observed that Participant 8 "was a little bit confused. So 'If I'm telling it what I'm doing, then what's the value of the feedback if it's agreeing with what I'm doing?' So I had to clarify that that's not the case." In this quote, the instructor is acknowledging Participant 8's confusion about how his feedback to the analyzer would be used and how the potentially modified feedback would eventually help him as a writer.

To expound the results for answering RQ2a, we observe that learners interacted with the RWT in both individual and patterned ways. The varied analyses of learner–RWT interaction data corroborate one another, with trends being revealed in what learners were doing in their RWT interactions and what the primary investigator and class instructor witnessed the learners doing in their draft revisions. For example, the instructor and researcher's observation of learners using feedback from the RWT for draft revisions provides further evidence of first-time RWT users' attempts to exploit the automated feedback to enhance the rhetorical effectiveness of their texts. From both ESP and SFL genre perspectives, learners' application of RWT feedback could be viewed as facilitating writers' recognition of structural patterning at the discourse level (Anthony & Lashkia, 2003) or discernment of lexicogrammatical features (Cortes, 2007) or Move structures (Flowerdew, 2002), all of which aid in building learners' genre knowledge.

Similar to results from the analysis of qualitative data answering RQ1a-c, the researcher and teacher witnessed learners making recommendations for the RWT to be improved. Just as study participants used the outlets of the post-task survey and stimulated recall responses to voice recommendations for RWT improvement, the learners also articulated their suggestions for RWT development during their in-class RWT draft revision in speaking to the instructor or their classmates. Learners' recurrent verbalization of proposed changes for RWT improvement, during in-class RWT interactions, in the stimulated recall sessions, and in open-ended post-task survey responses, suggests the users' insistence on having their suggestions heard; these continual recommendations could also indicate learners' investment in the RWT's improvement and willingness to contribute to the betterment of the tool, perhaps not only for their future use, but also for future use of other novice research article writers.

Analyses answering RQ2a further uncovers learners' interest in visuals, yet another finding from the analysis of instructor and researcher observations that reinforces outcomes from previously reported analyses. The instructor's observation that students were attracted to the RWT graphics in visual feedback (i.e., pie chart illustrations, color-coding of Moves, range bar displays) could be taken as a positive discovery in light of literature in the field of human–computer interaction. HCI scholars recognize visual aesthetics of an interface as encompassing both affective and cognitive factors (Hassenzahl, 2004). A website or application that is considered visually pleasing positively impacts a user's emotional and cognitive processes (Leder et al., 2004; Norman, 2004) and consequentially enriches a user's experience with the technology and boosts their positive evaluation of and attitudes towards it (Hartmann et al., 2007, 2008; Thuring & Mahlke, 2007). Study participants' attraction to the RWT's visual design may serve in amplifying their attention to particular rhetorical feedback or overall experience using the tool to improve their research article section draft.

It is not surprising that both the researcher and instructor observed the expression of affect among students during their RWT interaction. As was revealed in the qualitative data analysis of *affect* for answering RQ1a and RQ1b, expressions of emotions, such as excitement, frustration, confusion, and surprise, were also communicated by the RWT users during their in-class draft revisions. Study participants' expressions of affect during and in their reflections on their RWT experience may point to their emotional investment in their writing and/or the practice of modifying their texts with the AWE tool.

Conversely, the instructor and researcher's observation that some RWT users were trying to "fix" their texts could be perceived as an undesirable finding. One participant remarked she was attempting to obtain "all smileys" (P1) from the RWT analyzer, feedback which would indicate her inclusion of rhetorical functions in her text aligned with the average Introduction section in her discipline. Others stated their strategies for "fixing" the "errors" in their drafts, inferring they imagined there existed some solid standard for Introduction sections and all else deviating from the standard was unacceptable. Previous research in writing instruction has revealed that students may experience bewilderment when there is an absence of "visible" rules demonstrating what their writing should resemble (Lundell & Beach, 2003). If RWT users presume there is a standard format for research article sections in their disciplines, they may perceive the feedback they receive from the analyzer — suggesting ways to improve their writing — as mandatory rules for composing effective, publishable RAs. To prevent this, writing instructors using the RWT or other AWE software for formative purposes should encourage their students to explore a variety of published scholarship in their field and become critical readers of these texts skills, so the students do not envision a standard for generic writing or explicit “rules” which must be applied in composing a target text.

Similar to findings from the analysis of participants’ recorded screen captures, the instructor and researcher also noticed learners using non-RWT programs for making text revisions or taking notes on the RWT feedback. Some learners only edited their text in an external Microsoft Word document (instead of using the RWT text editor) and one participant even copied all Move- and Step-level feedback into a Word file. This substantial work in an external document may reflect learners’ apprehension about being able to return to the RWT. It may also reflect learners’ lack of trust that the RWT would save revisions to their drafts if they were to use the Analysis Module’s text editor feature. Madsen and Gregor (2000) describe user trust in an artificially intelligent program as how confident users feel when interacting with the system and how willing they are to act on the system’s provided suggestions. Though the study participants clearly acted upon the RWT’s suggestions, making revisions to their drafts in the RWT’s text editor box or in a Word file, potential uncertainty about or lack of trust in whether or not they could later access the RWT or in whether the RWT would save their draft modifications may have been an impetus for the use of non-RWT computer-based programs.

Another interesting finding from analyses conducted to answer RQ2a concerns students' use of two side-by-side browser windows during their draft revisions. The use of dual browsers demonstrates users' attempts to easily access the RWT feedback and apply the suggestions for text modifications, a process which allows them to make precise, comprehensive connections between the structuring of textual content and the text's linguistic features (Bruce, 2008). The use of two side-by-side screens further helps the writers to observe the "staged, step-by-step organization of the genre" through immediate comparisons of the RWT feedback and their section drafts (Eggins, 1994, p. 36). Promoters of the SFL approach to genre writing may deem the use of dual browsers as providing heightened opportunities for students to more deeply engage with their texts, attending to the schematic structure and linguistic components making up the genre, to enhance their academic writing.

In line with results from the sequence model analysis, the instructor and researcher also noted learners' extensive use of the Demonstration Module during their RWT draft revisions. Because a frequent learner interaction pattern showed the RWT users to edit their section draft immediately after accessing Demonstration Module examples, it seems the learners wanted to directly incorporate the learned research article genre knowledge into their revisions. ESP adherents would concede that use of the Demonstration Module provides RWT users textual forms that help them recognize the research article genre (Devitt, 1993). Examining these textual forms provides the RWT users with information about academic writing's "typical lexicogrammatical and discourse features unavailable in dictionaries or grammar books" (Flowerdew, 1993: 312). Yet understanding the textual composition of a genre is not enough to ensure successful communication through written texts. Many

(Belcher, 2004; Devitt, 1993; Swales, 2004) argue that it is also essential to identify the purpose and action a text aims to accomplish. Understanding the purposes of genres helps students identify those relevant features of specialized texts while not underestimating the context in which a genre is produced (Devitt, 1993). Understanding a genre's purpose, context, and textual forms, Bruce (2008) claims, will ensure novice writers, like those using the RWT, develop academic discourse competence, the ability to produce socially appropriate and linguistically accurate language in the academy.

How users interacted with the RWT further highlights the integral role of the RWT corpus in learners' AWE tool interaction for draft revision. The corpus-based approach to genre learning, one of the approaches on which the RWT is founded, is considered to be powerful for building writers' genre awareness (Aston, 2002). The RWT corpus, in particular, supplies users with Move and Step examples in the samples' lexical surroundings, thereby evading criticism of the corpus-based approach that warns of corpora's tendency to conceal texts' pragmatic features (Widdowson, 2002). RWT users' exploration of discipline-specific examples in the Demonstration Module corpus allows learners' to interact with authentic discourse embedded in its naturally occurring social and cultural context and to appreciate how the authors' linguistic choices convey certain functional meaning, what SFL advocate Gerot (2000) argues as a critical determinant of successful communication in the genre. RWT users' interaction with the contextualized examples of published texts in their academic discourse community ushers in an understanding of not only what published authors in the field are doing, but also how those authors' communicative purposes are achieve (Swales, 1990).

Users' interaction with the RWT also emphasizes the importance of the Demonstration Module in learners' draft revisions, an interaction the instructor seemed to hypothesize as perhaps being more prevalent among the non-native English speaking students. While the trend was not observed in a review of the user interaction data, from an ESP standpoint, the RWT corpus may serve as a means for NNSs to learn the conventions of writing in the research article genre, while also presenting learners with a range of alternative linguistic forms and expressions for realizing communicative functions (Bhatia, 2002; Flowerdew, 1993, 2005; Hopkins & Dudley-Evans, 1988, 2000; Swales, 1990). As Leki and Carson (1994) argue, there is often a mismatch between the type of writing instruction furnished in ESL classes and the actual writing NNSs are expected to produce in their respective fields. An instructional technology like the RWT affords NNSs and NSs alike real-world opportunities for engaging with authentic academic discourse, cultivating conceptual understanding of generic writing and transcending the limits of explicit instruction in the composition classroom (Johns, 2003).

Furthermore, the use of corpora like the RWT corpus in the writing classroom is also promising in its potential to stimulate autonomous learning. In a corpus study by Yoon (2008), students took more responsibility for their L2 language learning as a result of using corpora in the drafting stages of writing. Yoon states that through students' interactions with authentic texts in the corpus, language learners were able to solve language problems, such as syntax, grammar, and coherence, on their own. Following Yoon's recommendations, initiating student-led RWT corpus searches may help supplement traditional writing instruction by helping raise learners' linguistic awareness through problem-solving and, simultaneously, encourage autonomous learning.

As the researcher recorded in her observational notes**,** some study participants sought the assistance of their classmates or the instructor during their RWT draft revisions. Working with classmates to build or clarify their knowledge of the research writing genre ties to principles of the social constructivist view of language learning which holds that knowledge building occurs through linking known ideas with new concepts (Ku, Bravo, & Garcia, 2004) and collaborating to make sense of created messages (Garner, 1995). RWT users' interaction among one another also fosters the establishment of an interconnected community of writers/scholars in the disciplines (van Zyl, 1993). In addition to the student–student collaborations, student–teacher interactions grow the language learners' communicative competence as the instructor is situated as a "mediating specialist" who assists in RWT users', not the instructors', analysis of their own and published texts (Flowerdew, 2005).

To help scaffold RWT users' generic knowledge by linking students' awareness of Moves and Steps in RA sections to the RWT, the class instructor in this study proposed future training sessions prior to in-class use of the AWE program for RA section draft revision. According to the instructor, a better training session may have helped in addressing some of the questions RWT users in this study had about the functioning or purpose of the tool as well as served to clarify potential misunderstandings of the Move/Step schema for Introduction sections. Yet, the lack of instructor specification about how learners should interact with the RWT likely had a positive impact on students' RWT interactions. Chen and Cheng (2008) have found that writing instructors who permit their students to decide when and how to use AWE software promote autonomous learning among users of a new program; this instructional flexibility coupled with sustained and repeated use of the automated system boosts, writers' attention to the systematic grammatical and syntactic inaccuracies in their writing, especially through use of software which integrates grammar-checking features (Warschauer & Grimes, 2008). Writing instructors who use the RWT to facilitate learners' research article genre knowledge development should allow the language learners time, both in and out of class, to work with the CALL application so they may develop their own effective learning strategies to improve their research writing skills (Iles, 2012).

Section 5.2. RQ2b- Learner Strategies for RWT Interaction

RQ2b — *What strategies do learners report using in their interaction with the RWT?*— was answered through quantitative analysis of learner responses on the pre-task questionnaire and qualitative and quantitative analyses of the participants' open-ended post-task survey responses and stimulated recalls. Data were then triangulated to capture a clear sense of learner strategies for the RWT draft revisions. A detailed report of the findings and discussion of what the findings signify follows the executive summary for RQ2b.

Executive Summary

Quantitative and qualitative data analysis findings for answering RQ2b reveal a variation in learner preferences for working versus learning new technology as well as a number of differing strategies for the learners' RWT interactions. Findings from the quantitative analysis of learners' responses to closed-ended items on a pre-task questionnaire show that learners typically prefer to work alone, but, when learning a new technology, most prefer to work with a partner or group. An analysis of learners' individual preferences for working and learning new technologies interestingly shows two distinct trends in the data: 1) learners who reported preferences for typically working alone prefer learning technology with a partner, and 2) learners who reported preferences for working in groups also prefer learning new technology with partners. It appears the majority of participants prefer working with a partner when learning new technology, no matter their preferences for regular working scenarios.

Results from an analysis of participants' open-ended responses on the post-task survey and stimulated recalls reveal RWT interaction strategies which were thought- or action-oriented and which fell into two broad classifications of being text- or tool-focused. Learners' reported text-focused, thought-oriented strategies concerned learner cognition, such as reading or interpreting feedback, reflecting on writing or rhetorical intentions, isolating areas for draft improvement, and developing plans for how to proceed with subsequent draft revisions. Participants' text-focused, action-oriented strategies referenced learners doing of activities such as searching for and using information from examples in the Demonstration Module, revising the drafts, and submitting section drafts for re-analysis. Tool-focused, thought-oriented strategies regarded learner thinking and were concentrated on understanding how to use the RWT, figuring out how the RWT functioned, and attempting to identify what the AWE tool expected from the learner. The only tool-focused, action-oriented strategy positioned the RWT as the focal point of the interaction and included learners providing feedback to the RWT.

To summarize, results from analyses conducted to answer RQ2b reveal distinct trends in terms of learners' preferred contexts for working and for learning new technology, and a number of commonly recognized strategies for interacting with the RWT. Detailed reports of the analysis findings and a discussion of what these findings mean in terms of answering the research question about learner strategies are provided in subsections of Section 5.2.

Quantitative Analysis for RQ2b

Descriptive statistics calculated from participants' responses to cloze-item questions on the pre-task questionnaire showed differences between how learners prefer to work and how they prefer to learn new technology. A summary of learners' preferred working and technology-learning situations (alone, with a partner, or with a group) are displayed in Table 5.2-1. As the table shows, more than half of the participants (55% or six of the 11) typically prefer to work by themselves. Three of the 11 (27%) prefer working with a partner and two (18%) prefer working with a group. The results are thus roughly split between half of the group preferring to work alone and half of the group preferring to work with one or more individuals.

Table 5.2-1

Summary of Participant Group's Working and Technology Learning Preferences

Pre-task questionnaire item	Alone	With a partner	With a group
In what context do you prefer to work?	6 (55%)	3 (27%)	2 (18%)
When learning a new technology, in what context do you prefer to work?	1 (9%)	9 (82%)	1 (9%)

However, a glimpse at participant preferences for contexts in which they learn new technology reveals a stronger partiality to one particular learning situation. Nine of the 11 participants (82%) noted they preferred learning new technologies with a partner. This represents a sharp distinction between preferred learning contexts considering only one participant (9%) indicated a preference for learning a new technology alone, and one preferred doing so with a group.

These results inherently spark questions about how exactly the group diverged in terms of learning preferences and which participants preferred to work and learn in which contexts. Table 5.2-2 provides a more detailed summary of individual participants' responses to pre-task questionnaire questions about working and technology-learning preferences.

Table 5.2-2

Overview of Individual Participants' Working and Learning Preferences

Pre-task questionnaire item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
In what context do you prefer to work?	A	G	G	P	P	A	A	P	A	A	A
When learning a new technology, in what context do you prefer to work?	P	P	P	P	G	P	P	P	P	A	P

Note: A= alone, P= with a partner, G= with a group

From Table 5.2-2, it can be observed that only three participants consistently marked they preferred the same contexts for both working and learning new technology; Participants 4 and 8 prefer to work with a partner when both working and learning new technology and Participant 10 prefers working and learning new technology alone. However, all other learners reported varied preferences for working and new technology. Also, it should be noted that most participants (10 of the 11, or 91%) prefer to work with one or more people with learning new technology, marking a deviation for the greater amount of reported learner preferences for working alone.

Interestingly, in studying the individual responses in Table 5.2-2, two distinctive trends emerge with regards to how participants differed in their preferences for working versus for learning a new technology. One trend involved participants who indicated preferences for working alone to also prefer learning technology with a partner. In fact, five of the six learners who indicated preferences for working by themselves preferred to learn a new technology with a partner; the sixth (P10) preferred to work by himself when learning a new technology. A second trend concerned learners who indicated a preference for working in groups to prefer working with a partner when learning a new technology. The only two participants (P2 and P3) who prefer to work in groups also remarked they preferred to learn a new technology with a partner. The only learner who did not fit any of the above-mentioned trends was Participant 5, who prefers to work with a partner, but learn new technology with a group.

The results thus show that while learners reported varying preferences for the contexts in which they work (with a more prominent preference for working alone), most participants (10 of the 11, or 91%) prefer to work with one or more people when learning a new technology. Perhaps learners prefer to work alone normally, but with others when learning new technology, because of their possibly limited background experience with AWE software or even technological tools. It is also possible learners prefer to learn technologies with others, because collaborative efforts to utilize a technology may help the users feel more supported as they navigate the unknown program features.

From a systemic functional perspective to language learning, learners' desire to cooperate with a partner or group members in learning a new technology it not an entirely unanticipated finding. The writers' participation in the research article genre is a social process that inherently involves consciousness of the writers' existence as members of disciplinary discourse communities (Dewey, 1966). Interacting with members of a student's discourse community on a larger scale involves composing research articles and fundamentally requires awareness of the norms of the genre. As novices to a community of practice, RWT users must engage in the social practice of communicating in their target discourse environments to build and apply genre knowledge (Schieffelin & Ochs, 1986). Therefore, study participants' preferences for working with others is not unnatural considering learning the research article genre already obliges social interaction;

interpersonal communication with classmates and colleagues during revisions to the social discourse the writers are producing seems a natural extension of this socialization process.

RWT users' preferences for working and learning new technologies may also have been impacted by a number of factors pertinent to individual learner's traits (Pujola, 2002). Scholars (e.g., Dornyei & Skehan, 2003; Heift, 2002; Pujola, 2002) point to the influence of users' unique personal characteristics and learning styles as variables affecting learner interactions with computer-based programs. Anything from how comfortable learners are in a CALL learning environment (Pujola, 2002) to their linguistic proficiency level (Heift, 2002) to how (and how well) they incorporate the AWE feedback (Hyland & Hyland, 2006) could have affected their interactions with the RWT as well as their preferences for using the tool for the first time.

Qualitative Analysis for RQ2b

An inductive analysis of participants' open-ended responses on the post-task survey and stimulated recalls revealed a number of strategies learners reported that using when interacting with the RWT. Interestingly, most of the strategy codes which arose from the qualitative data could be generally grouped into two predominant themes concerning the focus of the students' RWT interaction (text-focused and tool-focused), and within these themes, further sub-categorized into two sets describing what the strategy was achieving (thinking and doing). Figure 5.2-1 provides a visual summarizing the categorizations and sub-categorizations of codes referencing learners' reported strategies for their RWT interaction.

Figure 5.2-1. Themes and sub-categorizations of codes describing RWT interaction strategies reported by participants

As the figure illustrates, aside from the category "no strategy," the codes which emerged from the open-ended post-task survey responses and stimulated recalls could be roughly grouped into two overarching themes concerning the focus of users' strategies for interacting with the RWT; these two groupings have been termed "text-focused" and "tool-focused," and will be detailed further in the following discussion of codes and code categories. In brief, text-focused codes involve strategies concentrating on the students' improvement of the section draft and the text itself while tool-focused codes include strategies geared towards understanding the use or functioning of the AWE tool. Also indicated in the table are two sub-categorizations of these overarching themes among the codes; these sub-categories have been identified as describing "thinking" and "doing" strategies, and are also explicated in detail in the following explanation of the codes. In short, codes falling into the thinking category consist of more cognitive-based strategies involving interpretation and reflection, while codes fitting into the doing designation are more action-based and involve hands-on involvement with the RWT.

It should be noted that participants often cited multiple strategies they used while interacting with the RWT; this trend can be witnessed in the direct quotations integrated into the following code descriptions. That all participants reported varied strategies (including "No strategy") with regards to how they approached draft revision with the RWT suggests that no learners had simply one approach to their interactions, but rather interacted with the AWE tool in an assortment of ways.

Also worthy of note is that in the following description of the emergent codes representing learners' interaction strategies, there is a great deal of overlap in codes in given quotes. Within the same utterance, for example, multiple concepts could be expressed and, therefore, were identified, categorized, and counted for each code designation represented.

The following is a description of learners' reported strategies which arose from an inductive analysis of the qualitative data from participants' responses to open-ended post-task survey items and stimulated recall questions pointedly asking what interaction strategies learners used during their RWT draft revision. The discussion is organized by the overarching themes (text- or tool-focused) and sub-categorizations (thinking or doing) within the themes. Participants' direct quotes are integrated into the report of codes to illustrate how learners were recounting their strategies for interacting with the RWT for draft revision. Strategies reported by only one learner are included in this report and are alluded to in the description of the code. Frequency tallies of the reported interaction strategies and charts depicting distributions of the strategies follow the qualitative analysis in the section describing the data triangulation.

No strategy

The only response code which did not fit into the two principal themes of text-focused or tool-focused strategies was the report of no actual strategy whatsoever. When asked what strategies she used during her RWT interaction, one participant responded she had no particular strategy. In the stimulated recall, Participant 7 remarked "I don't think I had an overall strategy." However, this same learner did report other strategies she used during her RWT, both later during the stimulated recall and in her post-task survey response, as will be discussed after description of all strategies.

Text-focused

One major theme surfacing from the qualitative data on learner interaction strategies pertained to participants' focus on the text, or the draft of their section. Strategies falling into the text-focused theme included those oriented towards the improvement of the participants' draft. This theme comprised strategies involving both thinking and doing directly related to participants' improvement of their Introductions, including the interpretation of feedback, conceptual planning for how to improve the draft as well as actions taken to revise the draft. Most strategy codes fell into this theme category and will be discussed in greater detail in the following subsections.

Text-focused: Thinking. Part of the text-focused theme consisted of strategies for learners' RWT interactions that were cognitively based. These "thinking" strategies involved learners' mental processes and included conceptual strategies, such as reading or interpreting feedback, reflecting on writing or rhetorical intentions, isolating areas for draft improvement, and developing plans for how to proceed with subsequent draft revisions.

Reflecting on original rhetorical intention. One thought-oriented, text-focused strategy two learners reported entailed the participants' reflections on their rhetorical intent in particular passages of their draft or the text as a whole. "I acted/learned upon reflection of my original intention," Participant 3 stated, alluding both to his reflection on his intentions as an author, but also to the actions he took and what knowledge he gained in his reflection.

Another participant, Participant 1, emphasized the importance of her intended goals in her writing when discussing her strategy, recalling in the stimulated recall, "I did not want to have a tendency to please RWT while changing my sentences and moving away from my original goals." This participant seemed to acknowledge the significance of sticking to the original objective(s) in her writing, and was adamant about not being influenced to change those initial goals during her RWT interaction.

Understanding how text could be improved. Another text-oriented strategy involved learners' attempts to understand how to improve their text. This thinking strategy represented ways in which learners tried to understand feedback in terms of how it could be applied to revision of their draft. For example, in the open-ended survey responses, Participant 5 remarked, "[I] just tried to understand what steps I needed to improve for my final draft," and Participant 1 commented, "I wanted to see how I could express myself better" during the RWT interaction. Participants also emphasized their aim to pinpoint missing elements in their draft when reviewing the RWT feedback. In her stimulated recall discussion of her strategy for RWT interaction, Participant 5 stated, "I still had to think about – how do I put what is missing in my draft?" and Participant 4 also recalled that her strategy was to "Look around a lot to make sure I don't miss anything I should be aware of." Still others recalled a combination of goals for how they approached the RWT interaction, with Participant 7 claiming, "And I think it was a combination of curiosity as to how the computer was analyzing it, but also looking for support or suggestions for my writing," and then explaining, "I try to figure out it was misinterpreting it and therefore how I could reword things."

Determining (dis)agreement with feedback. A number of responses to questions about RWT interaction strategies centered on participants' goal of determining whether they agreed or disagreed with the RWT feedback. “Checking whether I agree with the designated move,” Participant 10 said in response to a post-task survey item asking him to describe his strategy for RWT interaction. In the stimulated recall, Participant 10 re-iterated, “At first I will see a… I mean, I think the Move 1, the definition of Move 1 is this, and why it disagree with me, I double-check it again,” pointing to agreement or disagreement with the RWT analyzer’s feedback and, again, using the words “checking” or “double-checking” to determine with what feedback he disagreed. Participant 2 also used the verb “checking” to describe her strategy, remarking “I was checking to see if the comment fits what I thought it would be”; this quote also alludes to the expectations the participant had based on the rhetorical goal she was intending to fulfill in the sentence, and her expectation that the feedback would align with that intended Step/Move. “Did the computer agree with what I was saying?” Participant 7 posed in her stimulated recall when asked about her RWT interaction strategy.

Confirming correct feedback. Reaffirming that the feedback was correct was another reported text-focused thinking strategy. In addition to determining whether they agreed or disagreed with the RWT feedback, one participant aimed to confirm which feedback was correct. Multiple times in his stimulated recalls, Participant 8 referred to his strategy of confirming which RWT feedback was correct before moving on to other elements of draft revision. “So, yeah, I started down here at Move 3, because I felt that was probably the most straightforward, about like me saying – okay, here’s what we clearly did, but yet it picked it up as Move 1,” Participant 8 stated, recalling how he targeted Move 3 feedback first, because he felt it was the most clearly articulated or recognizable Move in his text and could be confirmed most easily. “And then I went back through, and then I said, okay, this was right, this was right, this was right," Participant 8 went on to say, reporting his application of a strategy that targeted and confirmed which feedback was accurate.

Determining level of trust in tool. Another text-focused cognitively oriented strategy concerned establishing to what degree the RWT tool or RWT feedback could be trusted. One participant was resolute that she had first wanted to establish to what degree the RWT could be trusted before she accepted the feedback or made plans for her draft revision. In the stimulated recall, Participant 7 responded, "Here's my strategy – so much as first taking it as if I can trust it fully." This learner was hesitant to incorporate the RWT feedback when modifying her draft until she first determined how much the RWT, or RWT feedback, could be trusted.

Determining cause of error. In addition to learners' strategy for determining their level of trust in the RWT, some were also curious about the causes or origins of the feedback errors they were encountering, Participant 7 responded to a stimulated recall question about the strategies she used in her RWT interaction stating, "And then, when I ran into questions, trying to figure out whether it was myself that was in error or whether it was the computer in error, which then required confirmation from an instructor." This quote shows the learner's concern for detecting the cause of the mismatch between the intended rhetorical function and the function detected by the RWT.

Focusing on visual displays of RWT feedback. Yet another text-focused thinking strategy concentrated on visual depictions of the analyzer's feedback. Specifically, there was mention of a focus on the RWT feedback which is displayed in graphical form on the interface. In her open-ended survey response to the question about strategies used, Participant

9 responded, "I like to see my ability of writing graphically," seemingly implying her use of an approach concentrating on a visual display of the RWT feedback.

Moving from broad to narrow. One learner also described an interaction strategy that evoked the idea of moving from bigger picture issues in the writing to smaller details. In the stimulated recall, Participant 7 stated, "So I don't know that I really had an explicit strategy so much as it kind of just flowed from starting out with a broad point of view and then eventually narrowing down to details." Presumably, this participant moved from examining what to improve in her written draft in a big picture way to the smaller details she could address in her draft revision.

Chronological focus (Moves). In the stimulated recalls, one participant reported her strategy was to progress chronologically through the Introduction section Moves when addressing her section draft feedback. Participant 6 described her strategy in detail, commenting, "Like I first wanted to make sure that all of the stuff was Move 1 that looked like it was something else, I tried to go back and make sure it came through as Move 1 and then go to Move 2 and kind of work through those, and this is what I thought should be Move 2, make sure that they were coming through as Move 2 if I could do that, and then move on to Move 3 and fix that, kind of go through in that order." In the previous statement, Participant 6 even uses the word "order" to describe her chronological progression in addressing Moves 1-3 in her feedback. Participant 6 then summarized her strategy stating, "I think I tried to go through my Moves, kind of," again calling attention to the sequence with which she progressed through the feedback as part of her RWT interaction strategy.

***Chronological focus (Text*).** Another chronological strategy learners reported consisted of moving through their text, from beginning to end, conducting a sentence-by-sentence examination of the color-coded text they received back from the RWT analyzer. In an open-ended post-task survey response, Participant 7 noted, “I looked over the analysis first, then focused on each sentence,” suggesting after she examined the Move-level feedback at the right of the screen, she focused on her color-coded text, sentence by sentence. This participant confirmed her chronological strategy in the stimulated recall, saying “I think I was just working all the way through from beginning to end.” Participant 1 had a similar strategy, remarking, “I start to click on each sentence and give step-level feedback,” one sentence at a time.

Clarifying understanding of Move/Step. Two participants reported another text-focused thought-oriented strategy used in their RWT interactions which alluded to clarification of their understanding of the functional Moves and Steps in the Introduction section Move/Step schema. Participant 7 clearly stated her goal of confirming her understanding of the section functions, reporting, “I think I was trying to clarify my understanding of the actual Step, because I do remember that being a tricky part, because it was the kind of a thing that I was defining something.” Another learner, Participant 10, also alluded to his goal of clarifying his understanding of a Move during his RWT interaction, saying in his stimulated recall, “At first I will see a… I mean, I think the Move 1, the definition of Move 1 is this, and why it disagree with me, I double-check it again. And I’m pretty sure I’m right.” Here Participant 10 reports “double-checking” his understanding of Move 1, and the reports he was “right,” or that he had confirmed his understanding of the Move was correct (i.e., in line with the defined function of that Move).

Text-focused: Doing. Another sub-categorization of learner strategies for interaction with the RWT involves action-oriented approaches. These “doing” strategies included discussion of actions on the learners' part, and consisted of activities such as searching for and using information from examples in the Demonstration Module, revising the drafts, and submitting the texts for re-analysis.

Exploiting RWT examples. One text-focused strategy which referenced learner actions as opposed to thoughts related to participants' exploration and application of authentic published examples of the Moves and Steps available in the RWT Demonstration Module. Participant 1 seemed to employ this strategy a great deal, citing use of the approach in both her open-ended post-task survey response and stimulated recall. "For the feedback that showed me what needed more work, I looked at the examples and revised my sentences to see if RWT could identify my communicative goal correctly," Participant 1 stated in a post-task survey response. The same learner also remarked, "So like I changed one sentence using the words that I know existing in the system," announcing overlap in this strategy of using Demonstration Module examples and applying knowledge gained from these examples (knowledge of rhetorical conventions in her field) to revision of her draft. Furthermore, in her stimulated recall, Participant 1 explicitly indicated that the exploitation of RWT examples was her leading strategy, stating, "Examples was my most important strategy. I was looking at the examples."

Editing the text. Not surprisingly, a number of learners mentioned editing the draft as a major strategy in their interaction with the AWE tool. In her open-ended post-task survey response, Participant 1 recalls the order in which she edited the text for revision, asserting, "For the feedback that showed me what needed more work, I looked at the examples and revised my sentences to see if RWT could identify my communicative goal correctly." In the stimulated recalls, the same participant went on to say, "So like I changed one sentence using the words that I know existing in the system," and later, "And the second strategy was to rewrite the sentence and get it analyzed again to see if it was for the tool or not." With each of these three quotes, we witness overlap in the text editing approach and other approaches, such as identifying areas for writing improvement (thinking), exploiting RWT examples (doing), and submitting the text for re-analysis (doing). Other learners also commented on their "doing" strategies for RWT interaction: "And I changed the verbiage, maybe the sentence structure and the verb tense. And I believe it worked. (P3); "Then I change the sentence or condition where, okay, where I find out eventually we agree with each other" (P10); "At the first I just write according to my logic, but after I finish my writing, I think I will try to find some information" (P11). Notice how all of these direct quotes also include a mention of other strategies learners adopted during their RWT interactions, with much overlap amongst editing of the text and re-submitting the text to the RWT analyzer for more feedback.

Re-analyzing for more feedback. Another action-driven strategy in the text-oriented classification of codes referenced re-analysis of the draft. As with many other codes appearing in this qualitative data analysis, learners reported using this interactional strategy in tandem with others. For instance, in an open-ended survey response, Participant 1 noted, "For the feedback that showed me what needed more work, I looked at the examples and revised my sentences to see if RWT could identify my communicative goal correctly"; this quote depicts Participant 1's line of strategies for first identifying the text that needed work, editing the text, then submitting the new draft for a re-analysis. This same participant repeated this tactic in her stimulated recall response, noting, "And the second strategy was to rewrite the sentence and get it analyzed again to see if it was for the tool or not," emphasizing the re-submission of the draft for more feedback. In a stimulated recall quote by Participant 3, the learner alluded to the results of his re-analysis of the revised draft, stating, "And I changed the verbiage, maybe the sentence structure and the verb tense. And I believe it worked." In this example, the revisions the learner submitted produced feedback that was seemingly acceptable, or more acceptable, to the learner.

Tool-focused

Another central theme appearing in the qualitative data on learner interaction strategies concerned an emphasized focus on the RWT tool as opposed to the learner text. Reported strategies relating to a focus on the RWT consisted of codes centering on the actual use and functioning of the tool and were less concentrated on the explicit revision (or understanding of ways to revise) the section draft. The tool-focused theme encompassed strategies involving thinking and doing which, though perhaps indirectly related to participants' improvement of their draft, more overtly referred to the tool, centrally concerned the RWT, deliberation on the functioning or ways to use the RWT tool, and communicative interplay with RWT features.

Tool-focused: Thinking. Similar to the codes falling into the "thinking" category in the text-focused theme, the tool-focused, thought-oriented codes were associated with learners' strategies at a cognitive level. The thinking codes again pertained to learners' strategies for interpreting how to use the RWT, understanding how the AWE tool functioned, and attempting to discern what the RWT expected or wanted from the learner.

Understanding how to use RWT. A number of learners remarked that their strategy, in some way, involved understanding how to use the RWT. "Just learn how to use it," Participant 3 stated outright in his stimulated recall. In watching her recorded screen capture of her RWT interaction during the stimulated recall, Participant 4 pointed to the video, calling the researcher's attention to a particular point, stating, "I think you see that I spend a lot of time just looking around," and later said "I just try to figure out everything, so where is it and what does it do." Interestingly, Participant 4 followed up the discussion of her strategy for understanding how to use the AWE tool with a clarification of what she was *not* doing (i.e., thinking or exploring, not acting); "So I spent a lot of time just looking at it, like reading what's there, but not doing anything." Participant 8 also approached his RWT interaction attempting to understand how to use the tool, stating in his stimulated recall, "Using it the first time, you try to grasp," and later, "And I like to pick and things and see, okay, if I do this, what's going to happen, or if I do this, what's going to happen." Participant 8 went on to describe specifically how he explored the tool, asserting, "So a lot of it was figuring out the software rather than actually using the software to edit my paper." Common threads in both Participant 8 and Participant 4's comments are attempts to explore the RWT's capabilities and features, but also statements that this program exploration received more attention than actual text revision during the RWT interaction.

Understanding how RWT analyzes sentence. Other reported strategies centered on learner curiosity as to how the RWT functioned, especially in terms of how the tool was analyzing sentences. In the post-task survey responses, Participant 5 wrote "I tried to figure out how RWT analyzed my sentences and then know how to improve them." This statement reveals a combination of strategies: first, an attempt to understand how RWT analyzed her sentences, and second, an effort to identify how the sentences could be improved, seemingly based on the RWT feedback. Participant 7 also admitted curiosity about RWT functioning, saying, "And I think it was a combination of curiosity as to how the computer was analyzing it, but also looking for support or suggestions for my writing." This statement, like

Participant 5's previous statement, also suggests a combined strategy of figuring out how the RWT analyzer operates in addition to discerning what could be improved in the RWT users' written draft. Participant 8 clearly identifies his strategy for figuring out how the RWT analyzer interpreted and provided feedback on his draft in his stimulated recall response, stating, "I was trying to understand what it was thinking, was a lot of it, using it for the first time." This learner continued describing his strategy for understanding the RWT functioning, commenting, "And I like to pick things and see, okay, if I do this, what's going to happen, or if I do this, what's going to happen." This interplay with the system to figure out how it work, relates somewhat to the next described code, "understanding 'what RWT wants.'"

Understanding "what RWT wants." One of the same participants who claimed that understanding the use of the tool was a key strategy in her RWT interaction also cited her approach involved determining what the RWT "wants." In her stimulated recall, Participant 4 said, "Maybe it's because I work with Criterion, so I know there must be some way to crack it. Not really crack it, but to find out what it wants. That's what I'm thinking the most." In this statement, the learner connects her RWT interaction with a previous experience with another AWE program (Criterion), and relates her expertise using the other tool with a curiosity about what the RWT "wants"; presumably, in this quote, the participant is implying there is a way to get the feedback she is aiming to receive, but it involves "cracking" the system, as if there is a code to be broken or problem to be solved to obtain her intended feedback.

Tool-focused: Doing. The single strategy encompassed in the "doing" categorization of tool-focused codes concerned learners' strategies which were, in some way, centered on interaction with the RWT (with the tool being the primary focal point of the interaction). The only action-oriented strategy in this sub-classification connected to the learners' strategy to provide feedback to the RWT.

Giving feedback to the RWT. The sole strategy in the "doing" category of tool-focused interaction strategies related to learners providing sentence-level feedback to the RWT in the form of clicks on the thumbs up, thumbs down, or neutral thumbs buttons or writing out feedback to the RWT tool in the "Comments" box below the thumbs buttons. Several participants used the RWT Analysis Module's interactive feedback features to indicate their agreement (thumbs up marker), disagreement (thumbs down marker), or partial agreement (neutral thumb marker) with the RWT feedback on particular sentences, or to write out their intended rhetorical function (usually as the Step name) in the "Comments" box. In her open-ended survey response, Participant 1 stated, "If I could, I chose thumps-up and moved to another area that I needed to improve." Participant 6 reported the same strategy, recalling, "I then told it whether I agreed or disagreed. If I disagreed I tried to determine why it felt that way." In Participant 6's statement, it seems the learner provided not only an indication of whether she agreed or disagreed with the RWT's feedback for a given sentence, but also a justification for why she felt a sentence was achieving a different rhetorical goal. In her stimulated recalls, Participant 1 recalled a strategy that closely mirrored that reported by Participant 6, saying, "If I agree, then that was fine. If I didn't, then I made some explanations for the system. That's why I wanted to give comment." In this quote, we again observe a learner's strategy to give sentence-specific comments to the RWT, but in this case, only when the RWT feedback was deemed inaccurate by the RWT user. Participant 8 was another who cited providing feedback as a strategy for RWT interaction, claiming “So like here that’s what I’m doing, and I started back at the top and I was clicking ‘Yes’ to these ones that were all right.”

From these strategies’ varying foci, it is clear the participants had differing priorities in their RWT interactions. While some strategies were tool-focused and concerned the RWT’s functioning and use of the tool, others targeted the text and improvement of the learners’ section drafts. The strategies also diverged in their thought- or action-oriented focus. That most learners reported using numerous strategies demonstrates how participants’ use of the RWT for draft revision was multifaceted and that the writers’ goals, and execution of those goals, shifted more than once throughout their RWT experience.

The action-oriented and thought-oriented distinction could be informed by SFL perspectives of academic discourse development involving processes of both *learning* and *doing*. SFL proponents would argue the cognition and action involved in genre learning should urge writing instructors to fuse the *learning* and *doing* of academic writing. Some SFL researchers (Lui, 2005; Martin, Christie, & Rothery, 1987; Martin, 2009; Mohan & Slater, 2005) have offered explicit suggestions for how instructors may facilitate learners’ realization of the range of semiotic choices available to them in textual communication. Martin (2009), for example, provides careful, step-by-step guidelines for helping students envision themselves as active agents in the writing process and as situated in a context and culture of mutual influence. Positioning the language learner as an active participant, as both learner and creator of an academic genre, puts students’ needs as central considerations in writing instruction. Study participants’ specification of RWT interactional strategies involving both thinking and doing in their research article revision with the AWE program appears to imply the RWT supports writers taking on the role of active agents in contributing to reproduction of the research article genre in their disciplines.

A commonly cited thought-oriented, text-focused strategy entailed learners' improvement of their written text through reflection on their rhetorical intent. To best understand how to improve their section draft, participants were prompted to return to their text to closely examine the lexicogrammatical features of their writing and how the writing achieved or failed to achieve the meaning they aimed to express. By stimulating re-visitation of a learner's section draft, the RWT supported the writer taking on the role of "analyst" to carefully re-consider the functional meaning of the writing (Flowerdew, 2005). Flowerdew asserts this close analysis propels writers to decide for themselves what comprises effective generic writing and in turn helps cultivate skills for analyzing and producing future texts in the genre.

One particularly interesting finding from learners' report of RWT interaction strategies was the relationship of correctness of RWT feedback to the establishment of trust in the RWT; the influence of automated feedback accuracy on learner trust in the RWT was observed in the already reported findings related to RQ1b wherein learners were observed to associate perceived trust in the AWE tool to how in line the feedback was with the intended rhetorical meaning of their text. Heightening writers' trust in AWE systems may require not only increasing the automated feedback accuracy, but also allowing the program users more time to interact with and apply feedback from the tool (Scharber & Dexter, 2008). Therefore, in addition to improved trust in the RWT, participants' strategies for revising drafts with the RWT may also change as they increase time interacting with the tool, an aspect not observed in this study due to researcher's examination only of students' first-time use of the RWT.

From the examination of learner interaction strategies, it seems participants consumed RWT feedback in contrasting ways. Whereas some learners progressed through their section draft from beginning to end of the text in sentence-by-sentence fashion, others advanced through Move-level feedback sequentially, moving from Moves 1 to 3 in a linear order. Sequential progression through the RWT feedback or their analyzed texts may have alleviated a cognitive load for the learners as they were not required to draw heavily on their working memory by attending to linguistic forms and noticing features in a systemized and structured order (Chapelle, 1997). Processing Move-level feedback in an incremental sequence may have further lessened learners' cognitive loads as they considered how their texts achieved each communicative goal, one-by-one, instead of attending all at once to the entire functional schema for the Introduction section (Halliday & Martin, 1993). Addressing Moves in this way may suggest some students truly conceive of the CARS Model as providing discoursal building blocks for composing Introduction sections in their disciplines (Swales, 1990).

Learners' varied approaches for progressing through RWT feedback may mirror patterns Cortes (2007) has observed as a mixture of top-down and bottom-up analyses of texts. Some RWT interaction strategies depicted learners' movement from broad to narrow concerns as they addressed issues in their writing, what Cortes may distinguish as a top-down approach to the processing of data. Still other interaction strategies, such as detecting ambiguous lexicogrammatical realization of a rhetorical strategy, involved participants' identification of issues at the micro-level, what Cortes may characterize as a bottom-up approach. Though Cortes' characterizations were originally described in the context of textual analyses in language learners' corpus-based writing tasks, how RWT users interacted with the automated feedback exemplifies some of the same means by which novice writers process their own and others' texts as they build awareness of genre conventions (Flowerdew, 2002).

The action-oriented, text-focused strategy concentrating on learners' access and exploitation of examples from the Demonstration Module may have served to provide both NNSs and NSs new linguistic options for realizing Introduction section Steps, thereby broadening the RWT users' meaning-making potential as they composed disciplinary discourse (Derewianka, 1999). The use of corpora in writing instruction is championed for permitting novice genre writers the opportunity to explore how authors of target texts exploit linguistic devices to build and support their arguments (Lee & Swales, 2006). In addition to presenting a range of phonological, lexical, and grammatical options for realizing rhetorical strategies, study participants' engagement with language-mediated activities using the RWT corpus could have helped socialize learners into the community of practice of disciplinary research writing (Flowerdew, 2005; Hanna & de Nooy, 2003; Schieffelin & Ochs, 1986). When writers like those in this study have access to a spectrum of options for how to create meaning in their target contexts through corpora, for example, they build analytical skills for critically reading and successfully replicating writing in a genre (Belcher, 2004; Swales & Feak, 2004).

Learners' curiosity about how the RWT functioned, including how the AWE program processed their section drafts, shows how participants were attempting to make meaning not only from the feedback they received, but also potentially from the tool itself. Just as students analyzed the RWT feedback with respect to particular sentences in their writing, they engaged in a simultaneous meta-analysis of the vessel delivering the feedback. Learner strategies for understanding RWT functioning may have stemmed from a genuine curiosity about the technology or derived from questions of trust of the tool. As previous research has shown, some AWE program users believe that understanding the capabilities and restrictions of the technology helps them decide to what degree they can rely on the feedback from the automated system (Scharber & Dexter, 2008). Yet the same researchers also observed that not all writers desire to be aware of how the AWE tool generates the formative feedback. Some RWT users' mention of strategies for ascertaining how the analyzer worked indicates a curiosity by a portion of the class about where their individualized feedback originated, but does not necessarily imply an interest from all learners.

Study of how learners interact with the RWT is critical because it supplies knowledge about how well the automated feedback provides opportunities for language learning. Furthermore, such research helps provide suggestions and potential ideas for how the tool and like tools can be adapted so that the output (RWT feedback) can be expressed and delivered in the most understandable, easily accessible format to language learners (Hegelheimer & Chapelle, 2000). RWT feedback that is enhanced to be more explicit in providing negative evidence will assist RWT users in noticing gaps between their own output and the target language input, and encourage writers to bridge these gaps in subsequent text revisions.

Triangulation

A triangulation of data results answering RQ2b about learner strategies for using the RWT shows learners' more and less commonly cited strategies for RWT interaction, with those coded as "thinking" strategies appearing more frequently in the qualitative data. The triangulation also reveals the elevated number of reports of text-focused, as opposed to tool-focused, strategies amongst the participants. In this section, quantitative tallies from the two qualitative data sources (post-task survey responses and stimulated recall responses) are compared, then combined to examine the overall dispersal of each reported strategy compared to other reported strategies. These findings are then discussed concurrently with the findings from the quantitative data reporting learners' preferred contexts for working and learning new technology to uncover any potential connections between working and learning contextual preferences and reported RWT interaction strategies.

Table 5.2-3

Numerical Tally of Codes Emerging from Participant Responses by Qualitative Data Source

Code	Open-ended survey responses	Stimulated recalls	Total
No Strategy	0	1	1
Text-focused			
(Thinking)			
Reflecting on original rhetorical intention	2	0	2
Understanding how text could be improved	5	5	10
Determining (dis)agreement with feedback	1	7	8
Confirming correct feedback	0	3	3
Determining level of trust in tool	0	1	1
Determining cause of error	0	1	1
Focusing on visual displays of RWT feedback	1	0	1
Moving from broad to narrow	0	1	1
Chronological focus (Moves)	0	2	2
Chronological focus (Text)	1	2	3
Clarifying understanding of Move/Step	0	2	2
(Doing)			
Exploiting RWT examples	1	2	3
Editing the text	1	5	6
Re-analyzing for more feedback	1	2	3
Tool-focused			
(Thinking)			
Understanding how to use RWT	0	9	9
Understanding how RWT analyzes sentence	0	8	8
Understanding "what RWT wants"	0	1	1
(Doing)			
Giving feedback to the RWT	2	4	6

Table 5.2-3 displays the numerical tallies from codes emerging from participants' open-ended post-task survey responses and stimulated recalls regarding their reported strategies for interacting with the RWT for draft revision. Note that the codes are separated by their overall orientation (as text-focused or tool-focused) and subcategories (of thinking and doing) therein.

From the table, it is clear which strategies were mentioned more by participants in both the stimulated recalls and post-task survey responses. While there are more text-focused codes overall, some tool-focused code categories were mentioned frequently by the learners. Obviously, in both the post-task survey responses and stimulated recalls, participants frequently reported (with 10 total mentions) the text-focused strategies of understanding how the text could be improved and determining agreement/disagreement with the RWT feedback (with eight total mentions). The tool-focused strategies of understanding how to use the RWT (with nine total mentions) and understanding how the RWT analyzes sentences (with eight total mentions) were the most widely mentioned strategies. Interestingly, the four most commonly cited strategies for RWT interaction fit within the "thinking" categorization.

To better understand the occurrence of each reported strategy in both the qualitative data sources, a dissection of how much each reported interaction strategy constitutes the overall reported strategies may be helpful. Table 5.2-4 shows a breakdown of the percentage presence of each code in the qualitative data in comparison to the presence of other codes (i.e., the percentage of each RWT interaction strategy compared to other reported strategies).

As the table illustrates, text-focused strategies constitute 66% of the overall strategies learners reported in their RWT interactions, while tool-focused strategies make up 34% of the overall codes. Also worthy of note in Table 5.2-4 is that all the strategies constituting above 10% of the overall strategies reported are “thinking” strategies. “Doing” codes comprise just 25% of the overall RWT interaction strategies reported. To capture a visual sense of the percentage presence of these reported strategies in the post-task survey and stimulated recalls, Figure 5.2-2 provides a graph representing the distribution of the codes in terms of how much each code is represented in the overall number of reported strategies.

Table 5.2-4

Summary of Overall Percentage of Each Code Compared to Other Codes in Qualitative Data

Code	Percentage of code
Text-focused	
(Thinking)	
Reflecting on original rhetorical intention	2.9
Understanding how text could be improved	14.6
Determining (dis)agreement with feedback	11.4
Confirming correct feedback	4.2
Determining level of trust in tool	1.4
Determining cause of error	1.4
Focusing on visual displays of RWT feedback	1.4
Moving from broad to narrow	1.4
Chronological focus (Moves)	2.9
Chronological focus (Text)	4.7
Clarifying understanding of Move/Step	2.8
(Doing)	
Exploiting RWT examples	4.2
Editing the text	8.5
Re-analyzing for more feedback	4.2
[Total for text-focused codes]	66.0
Tool-focused	
(Thinking)	
Understanding how to use RWT	12.7
Understanding how RWT analyzes sentence	11.4
Understanding "what RWT wants"	1.4
(Doing)	
Giving feedback to the RWT	8.5
[Total for tool-focused codes]	34.0

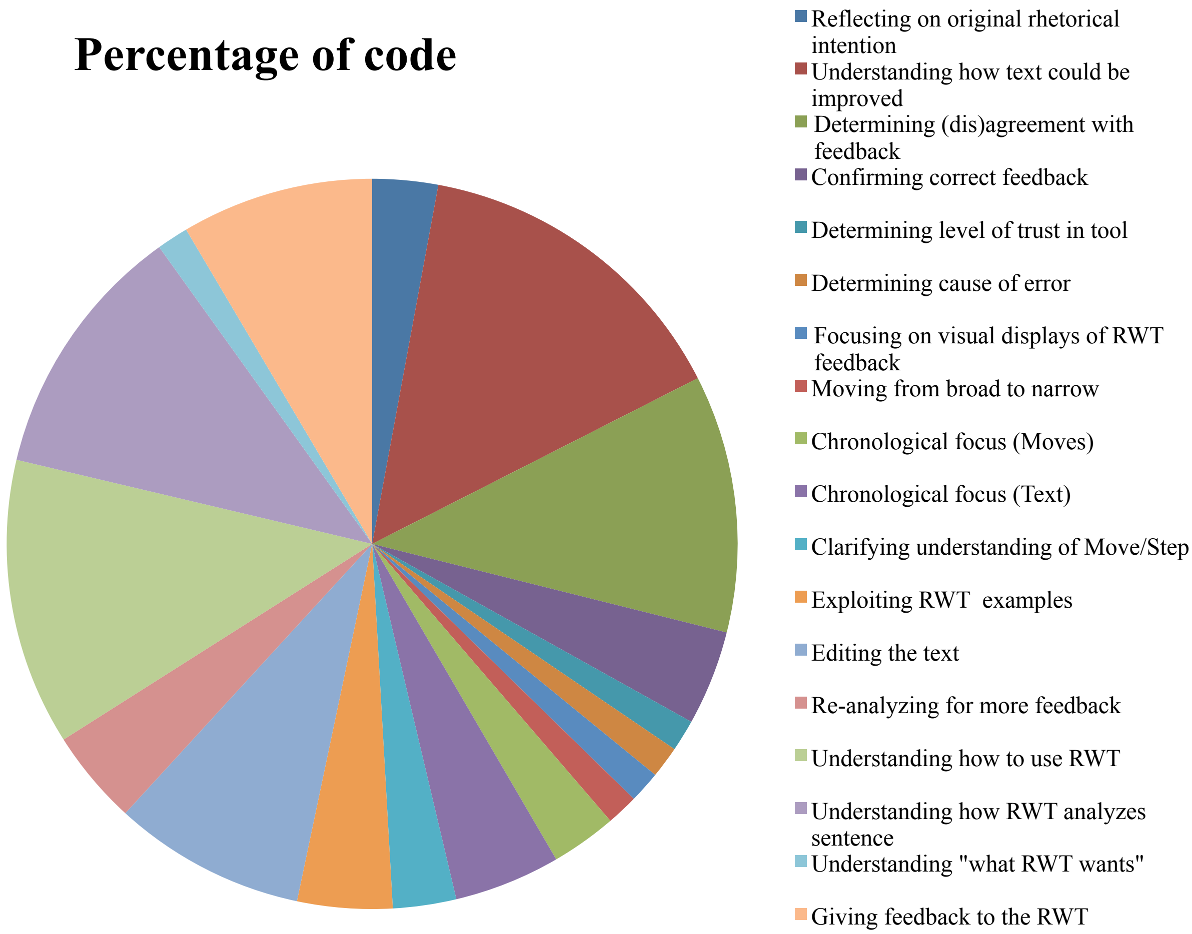


Figure 5.2-2. Depiction of overall percentage of each code in participants' responses in the qualitative data

As was reflected in the numerical tallies of codes by data source in Table 5.2-3 and the overall combined percentage presence of the codes in the scope of reported strategies in Table 5.2-4, Figure 5.2-2 clearly depicts most frequently reported RWT interaction strategies. What the varied sizes of sections of the pie chart also show, however, are precisely how many more times some strategies were reported than others. The codes understanding "what RWT wants," or determining the cause of error, or determining level of trust in the RWT, for instance, are cited substantially less than others, whereas understanding how to use the RWT, determining (dis)agreement with the RWT feedback, or understanding how the text could be improved are reported more frequently.

Discussing the tallies of the RWT interaction strategies mentioned in the coded qualitative data in combination with findings from the quantitative results may shed light on intersections among the data. As a review, the quantitative data analyses revealed that while many participants enjoy working alone, 10 of the 11 participants prefer learning new technologies with a partner or a group. Furthermore, most of the participants who preferred to work also indicated preferences for learning new technology with a partner, while those who preferred to work in groups also reported a preference to learn technology with a partner.

The change in learners' preferences for working alone versus in situations where they must learn technology may somehow be related to the learners' reported strategies for interacting with the RWT. The overwhelming reported preference for learning new technology with a partner (as opposed to with a group or alone) could possibly be connected to learners' strategies for interacting with the RWT, especially those aimed at understanding how to use the RWT or understanding more about the functioning of the AWE program. It may be that learners view learning new technology with a partner as an advantage, as the pair can work together to not only navigate the new AWE program, but also strive to make meaning from the feedback and figure out how that feedback can be applied to improve their writing.

A cited preference to work with a partner to learn new technology may also be rooted in participants' acknowledgement of the social nature of the discourse they are producing. Understanding their research writing encompasses participation in an academic discourse community and that writing helps socialize novice researchers into that community, the learners could prefer to work with other, or in other words, to be social in this social process (Halliday, 1978). As they familiarize themselves with the conventions of disciplinary writing and learn to make authorial choices that best communicate their message, going through the "apprenticeship" with another novice writer may be comforting (Berkenkotter & Huckin, 1995).

Though the participants in this study were not explicitly told *not* to work with partners, they primarily learned this new technology on their own, though still communicating at times with their neighbor or the instructor. If the learners had been placed into pairs, learning how to use the RWT with a partner, the strategies they reported in the post-task survey or in the stimulated recall could have been impacted. The presence of a partner, for example, may have eliminated some learners' prolonged struggles understanding how to access certain feedback, confirming there were inaccuracies in the analyzer's feedback, or deciding how much trust to place in the AWE tool.

However, despite the reported preferences to work with a classmate when first encountering a new technology, learners' mostly independent use of the RWT likely facilitated a more intensified focus on the RWT features and functions and development of problem-solving strategies for interacting with the RWT, techniques which may not have been cultivated if a learner had relied on a partner during their RWT draft revision. As New Rhetoric genre learning theory holds, students learn a genre by participating in writing in that disciplinary context, as opposed to explicit instruction (Berkenkotter & Huckin, 1995; Freedman, 1993). Independent interaction with the RWT may have contributed to learners' heightened engagement with the discourse, both their own and other published authors', through close reading of the texts, amplified concentration on the feedback, and the development of personal cognitive and interactional strategies for discerning the generic requirements of writing in their disciple (Berkenkotter & Huckin, 1995).

That participants mentioned the use of more text-focused than tool-focused strategies is not entirely surprising considering the aim of the draft revision activity was to have learners explore and improve the writing in their drafts, not to learn the interworking of the RWT. The increased interest in text over the tool is no doubt also encouraging for RWT developers, as the intent behind the conceptualization of the RWT is to assist writers in improving their research writing skills by analytically engaging with their drafts and reviewing their rhetorical intentions, not to orient users' attention towards the tool. Participants' text-focused strategies point to the writers' attempts to extend their meaning-making potential via practice constructing and re-constructing the discourse (Derewianka, 1999), as opposed to discovering how the AWE tool operates.

Participants' heightened attention to text, however, does not necessarily denote interaction with their own texts; the text-oriented strategies also include engagement with published research in the discipline, available in a searchable concordancer in the RWT Demonstration Module. As Cortes (2007) stresses, student interaction with corpora promotes increased recognition of the features of the genre writing as students identify and resolve mismatches between the research writing typical of the genre and their own texts. Fusing this disconnect between RWT users' texts and published texts in the field promotes RWT designers' envisioned process-oriented uses of the RWT as the writers become aware of the array of linguistic choices communicators make to convey meaning in similar contexts the novice writers are reproducing.

That thinking strategies were more commonly cited than doing strategies is also not unexpected in light of the idea that the writing revision process necessarily involves learners receiving, deciphering, and planning applications of the feedback. Such processing of the RWT feedback fits notions of the interactionist approach to language learning (Chapelle, 1998; Swain, 1985), which hypothesizes that input forces language learners to compare their own language with TL samples, identify the gaps between the TL input and their own output (Gass & Mackey, 2007), and establish new hypotheses about the L2 to apply to ensuing creations of modified output. As RWT users receive feedback on their section draft from the analyzer, they are led to compare their output, written RA section drafts, to TL structures, published research articles in their disciplines. Recognizing discrepancies between realizations of communicative goals for Introduction sections in their own drafts versus the target published texts guides the RWT users towards developing and implementing writing strategies to make their section drafts more communicatively effective.

It should be kept in mind that many students, even the one who reported employing "no strategy," named the use of a number of strategies in their RWT draft revisions. The use of many means for interacting with the RWT implies that learners adopted not a singular, but rather multidimensional approach to their RWT interaction. The flexibility in modifying interactional strategies as the situation dictates suggests learners' adaptation of their genre learning to evolving contexts of use and practice (Derewianka, 1999). As the RWT users encounter new genre knowledge, possibly through the individualized sentence-level analytic feedback on their drafts or through investigations of authentic discipline-specific examples in the Demonstration Module, they must reexamine their approaches for not only interacting with the RWT, but also learning the genre; the complexity of learners' RWT draft revision experience, evidenced in the breadth and multiplicity of their reported interactional strategies, points to the dynamic process of genre knowledge development.

Reflecting on learners' strategies for interacting with new CALL technology helps writing instructors and material designers gather indispensable information about not only *what* writers learn, but also *how* they learn (Hutchinson & Waters, 1987). Identifying and grouping technology users' interactional patterns permits language learning researchers to distinguish variations in how a computer-based application is manipulated to facilitate effective language development (Heift, 2002). Because Heift has proposed that students' technological interactions be investigated alongside the students' individual characteristics, this dissertation proceeds to a report and discussion of findings aimed at better understanding the impact of learner variables in language learners' initial interactions with CALL software.

Section 5.3. Summary of Findings for RQ2a-b

Analyses conducted to answer the research questions of RQ2 revealed learners' similarities and differences in their interactions with the RWT and clearly marked strategies for learner –RWT interactions. Learner interaction data revealed behaviors that concentrated on resourceful consumption of RWT feedback in draft revisions; one example of such consumption was witnessed in students' use of side-by-side browser windows on participants' computer screens allowing RWT users to efficiently incorporate RWT feedback and access authentic Move and Step examples from published research in the Demonstration Module as they made revisions to their Introduction section drafts. Learners' reported strategies for use of the RWT could be grouped into two prominent categorizations— tool-focused and text-focused — and were geared towards being action- or thought- oriented.

From the analyses conducted to answer RQ2a — *How do learners interact with the RWT tool?* — it appears that learners interacted with the RWT in both individualized and patterned ways. An analysis of learners' mouse hovers and clicks on certain RWT features, as recorded in the RWT database, showed variation in how individual participants used the RWT elements. In particular, the descriptive statistical analysis revealed learners frequently accessing the range bar that compares a breakdown of Moves in the student's Introduction section draft and Introduction sections from published articles in the student's discipline and mouse hovers over and clicks on the color-coded analyzed sentences of the analyzed drafts.

A cross-comparison of the degree of user –RWT interactivity and drafts submitted for re-analysis reveals that more mouse clicks on and hovers over RWT features does not implicate a learner will submit more drafts to the RWT analyzer. The analysis of screen capture data revealed more in-depth results concerning RWT users' on-screen behaviors. An analysis of the sequence with which learners interacted with the RWT features reveals some patterned interactions, such as back-and-forth interactions with particular features of the RWT (e.g., back-and-forth movement between draft editing and checking Demonstration Module Move/Step examples).

A time-on-task analysis of the screen recording data revealed that participants spent the most amount of time interacting with their own texts and providing feedback to the RWT analyzer on particular analyzed sentences in the students' texts. The majority of feedback given to the analyzer was negative, perhaps suggesting that participants felt the need to defend the rhetorical intentions of their sentences when they did not agree with the RWT analyzer's feedback. Some learners also spent much time interacting with non-RWT programs, such as Microsoft Word, to take notes on their individualized RWT feedback or revise their section drafts. Analyses of the teacher and primary investigator's in-class observations uncovered interesting off-screen student behaviors, such as communicating with other classmates, asking the instructor about the purposes of the RWT or about feedback inaccuracies, expressing excitement, frustration, or confusion during their RWT interactions, and using side-by-side browser windows to access RWT feedback more efficiently. Learners' close attention to incorporating feedback from the RWT and exploiting authentic published Move and Step examples from the RWT corpus points to learners' willingness to consider the RWT's suggestions in improving their section drafts.

Analyses conducted to answer RQ2b — *What strategies do learners report using in their interaction with the RWT?* — show distinctive trends in learners' preferred situations for working and learning new technology and multiple interactions strategies for RWT draft revision. Whether learners typically preferred working alone or in groups, they preferred working with partners when in contexts where they learn new technology. Analyses of learners' stimulated recall data and open-ended survey responses exposed two major areas of focus in learners' reported interactional strategies: text-focused and tool-focused. Text-focused strategies were used to concentrate on improvement of the students' drafts, while tool-focused strategies directed learners' attention to the RWT and its functioning and purpose. Within these two overarching classifications, learner strategies could be further identified as being thinking- or doing-oriented. Thinking strategies involved learners reflecting on the meaning of their discourse, processing the feedback, and devising plans for draft revisions. Commonly cited text-focused strategies included determining how the text could be improved, discerning [dis]agreement with the RWT feedback, and editing the draft. Frequently reported tool-focused strategies were understanding how to use the RWT, figuring out how the RWT analyzes sentences, and providing feedback to the RWT. The RWT's provision of multiple opportunities for novice writers to they interact with the AWE tool in their own individualized ways enables learners' control over their own draft revision experience (Cotterall, 2000) and positions the learners as responsible for their own genre knowledge development.

Overall, findings for RQ2a-b show variation in how learners interacted with the tool as well as the strategies for RWT draft revision. Participants were inclined to cite preferences for working with a partner when learning new technologies, perhaps a result of the social nature of the discourse as learners engage in the social practice of participating in their scholarly communities (Schieffelin & Ochs, 1986). Learners' inclination to report the use of not one, but multiple strategies for use of the RWT points to the complexity of participant-RWT interactions and their changing priorities throughout their RWT draft revision experience.

CHAPTER 6.

RESULTS AND DISCUSSION FOR RESEARCH QUESTION 3

The final combined Results and Discussion chapter of this dissertation reports and discusses the findings of analyses conducted to answer the third research question. The chapter is organized by the report and interpretation of findings for the two questions under RQ3 on the perceived impact of learner variables on learners' RWT experiences. To review, these questions were:

RQ3a: *How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?*

RQ3b: *What other learner variables do participants perceive as impacting their interaction with the RWT?*

Similar to Chapters 4 and 5, executive summaries giving explicit answers to the research questions are positioned at the beginning of each section of Chapter 6. Results of the quantitative and qualitative analyses are provided prior to data triangulation conducted for answering the research questions of RQ3.

Findings in response to questions related to RQ3 about the perceived impact of learner variables on users' interactions with the RWT reveal that there was much variability in learners' background experience with and frequency of use of differing forms of technology. There were also major differences in learners' reported comfort levels felt when conducting a number of computer-based tasks or working with new forms of technology. Results of the second question in RQ3 show that participants cited individual learner variables, such as their personality, status as a non-native speaker of English, and discipline of study, as impacting their experience with the RWT. This chapter reports and discusses the results of analyses corresponding to each research question pertaining to RQ3 on learner variables impacting participants' RWT experience.

Section 6.1. RQ3a- Influence of Technological Experience on RWT Interaction

In response to RQ3a — *How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?* — both quantitative an qualitative data were used. Results from the quantitative analysis are presented first, followed by results of the qualitative analysis. Discussion of the findings appears after the report of results for each analysis.

Executive Summary

Results of analyses conducted to answer RQ3a on how learners perceived their background experience with technology as impacting their RWT interactions showed varying learner background experience and comfort levels with technology as well as a number of cited impacts from past computer use as affecting learners' RWT experience. Analyses of pre-task questionnaire response items gauging participants' past experience with computers showed that, prior to their use of the RWT, participants had commonly engaged in tasks involving computers for activities such as word processing, graphic manipulation, creation of tables, and using Powerpoint, but were, as a group, less involved in some activities, like the use of AWE tools or CALL software. The results also showed learners' individual reports of background technological experience to be quite varied; some participants had never used a computer language or created a website, while others frequently or always uses computer languages or are involved with website creation. There was also much variance in learners' reported comfort level accomplishing computer-based tasks, with some participants feeling "very comfortable" learning new technology, using computer-based language learning tools, and solving problems encountered when using the computes, and others feeling "not comfortable at all" or only "slightly comfortable" performing the above tasks.

Qualitative analyses of learners' stimulated recalls revealed that learners perceived their background experiences with technology as influencing their interactions with the RWT in a number of ways. Specifically, learners believed their past computer experiences as affecting their attitudes towards computer-based tools, curiosity about the RWT's capabilities, interest in the RWT feedback, degree of interactivity with the RWT, time required to become familiar with the RWT and exploit its features fully, and learners' developed reliance on the RWT and confidence in working with the AWE tool. A tally of the number of mentions in the qualitative data showed learners perceived the RWT's ease of use to be influenced most by previous technological experience. Other frequently cited impacts from past computer experience were the time learners needed to become familiar with the RWT and their ability to navigate the RWT.

In all, the analyses answering RQ3a show that RWT users perceived their previous experience with computers as influencing a number of aspects in their RWT interactions. What follows is a more in-depth explanation of how learners understood their technological background impacting their draft revision with the RWT and what this means in light of past findings.

Quantitative Analysis for RQ3a

Quantitative analyses of learners' responses to items on the pre-task questionnaire gauging learner experience with technology showed that the participants commonly engaged in tasks involving computers for activities such as word processing, graphic manipulation, creation of tables, and using Powerpoint, but were less involved in front-end or back-end building of computer-based applications, such as involvement in tasks using programming languages or creating websites, and utilizing AWE tools. Descriptive statistics summarizing participants' responses to Likert-scale items asking learners how often they perform certain tasks using specified technology (with a response of “1” signifying “never” and “4” signifying “always”) are provided below in Table 6.1-1.

What can be observed from the Median and Mean of participants’ responses to a number of response items involving computer use shows that many learners frequently use a computer, install a program on a computer, create Word documents on computers, conduct research using computers, manipulate graphics and pictures on computers, use various word processing functions, and use Powerpoint. Standard Deviation values in all of these categories remain under 1.00 (between 0.46-0.75), suggesting more consistency among

Table 6.1-1

Descriptive Statistics for Pre-Task Questionnaire Items Asking How Often Learners Perform the Following Tasks

Pre-task Questionnaire Item	Median	Mean	St. Dev.
use a computer	4	3.67	0.46
install a program onto a computer	3	3.11	0.75
create a Word document	4	3.67	0.5
conduct research using the computer	4	3.56	0.5
manipulate graphics/pictures on the computer	4	3.56	0.69
use tables, styles or templates with word processing	4	3.44	0.69
use PowerPoint	3	3.33	0.5
create websites	1	1.56	0.81
use a computer language (e.g., html, php, java)	2	2.22	1.03
use social media (e.g., Facebook, Twitter)	3	2.89	1
use computer-based language learning resources	3	2.22	1.21
use automated writing evaluation tools (e.g., Criterion)	1	1.44	1.04

Note. N= 11. All response scores based on a Likert-scale where 1= never and 4= always.

individual learners’ responses to the questions. Also, from Table 6.1-1 it is clear (from Mean and Median values) that the participants have less experience creating websites, using computer programming languages, and using AWE applications. The use of social media and use of computer-based language learning resources seems less frequent among participants, as shown in Median values of 3 and Mean values of 2.89 and 2.22, respectively. Still, the Standard Deviation values in participants' responses on use of social media, computer-based language learning resources, AWE tools, and computer languages are all 1.00 or above, indicating more variation in learners' responses concerning the frequency with which they use these technology tools or capabilities.

Table 6.1-2

Individual Participant Responses on Pre-Task Questionnaire Items Asking How Often Learners Perform the Following Tasks

Pre-task Questionnaire item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
use a computer	4	4	4	4	4	3	3	4	4	4	3
install a program onto a computer	4	3	3	4	3	2	2	4	4	3	3
create a Word document	4	3	4	4	4	3	3	4	4	4	3
conduct research using the computer	4	4	4	4	4	3	3	4	4	3	3
manipulate graphics/pictures on the computer	3	4	4	4	4	3	3	4	4	4	2
use tables, styles or templates with word processing	4	3	4	4	4	3	3	4	4	3	2
use PowerPoint	4	3	4	3	4	3	3	3	4	3	3
create websites	2	2	1	3	3	2	1	1	1	1	1
use a computer language (e.g., html, php, java)	3	3	2	4	3	2	1	3	3	1	1
use social media (e.g., Facebook, Twitter)	4	3	1	4	2	3	2	3	4	4	3
use computer-based language learning resources	4	2	3	4	3	1	1	1	3	3	1
use automated writing evaluation tools (e.g., Criterion)	3	1	1	4	2	1	1	1	1	1	1

Note. N= 11. All response scores based on a Likert-scale where 1= never and 4= always.

A closer examination of individual participants' answers may shed light on the discrepancies between participants' individual responses to the questions concerning their frequency of use of the specified technology. Table 6.1-2 provides a breakdown of participants' responses to the question items gauging how often they perform the given tasks.

From individuals' responses to the Likert-scale items shown in Table 6.1-2 it is clear there is much variation in the frequency with which participants perform computer-related tasks. One item showing intense variation in participants' responses was that asking students how often they use a computer language. Three participants (P7, P10, and P11) have never used a computer language, while Participant 4 always uses computer languages. Five other participants (P1, P2, P5, P8, and P9) use computer languages sometimes, while two others (P3 and P6) seldom do. The creation of websites was another category where participants' responses differed more, with six participants (P3, P7, P8, P9, P10, and P11) noting they have never created a website, three (P1, P2, and P6) stating they rarely do, and two (P4 and P5) remarking they sometimes do. The use of social media was another task in which participants' responses varied. Participant 3 has "never" used social media before, while Participants 1, 4, 9, and 10 use social media "always." Similar divides in participants' use of technology were revealed in responses to the item gauging learners' use of computer-based language learning resources, with two participants (P1 and P4) "always" using the resources, four participants (P6, P7, P8, and P11) "never" using the resources, four participants (P3, P5, P9, and P10) "sometimes" using the resources, and one participant (P2) using the resources "rarely." Finally, the use of AWE programs among students was highly varied, with all but three participants (P1, P4, and P5) remarking they had "never" used AWE tools.

Likewise, some tasks appear to be frequently engaged in by the participants, as shown in their responses of "always" or "sometimes" to the items. Those activities which were more common among students were the use of a computer, creation of Word documents, use of Powerpoint, and use of computer for conducting research. Installation of a program, manipulation of graphics or pictures, and usage of Word processing capabilities are also quite prevalent among participants, with no participants remarking they had "never" accomplished these tasks, and one to two participants per item remarking they only "rarely" completed these tasks.

What is also evident from Table 6.1-2 is that there are some students who are simply more involved or less involved with computer-based tasks. For example, Participant 4 marked a "4" or "3" for each question item, noting she "always" or "sometimes" engaged in each of the technology-based tasks. Other participants (P1 and P5) also mostly marked that they "always" or "sometimes" are involved in the technological tasks, and noted they "rarely" are involved in only a few of the described computer-based activities. By contrast, some participants (P3, P7, P10, and P11) marked they "never" perform at least three of the specified computer-based tasks, and "rarely" perform many of the others.

The contexts in which computers were used were strikingly similar among the participants. Table 6.1-3 provides a summary of the descriptive statistics for participants' responses to Likert-scale items gauging how frequently learners use a computer for the designated activities. As can be seen in the table, students indicated they "always" (marked by a value of "4") or "sometimes" (marked by a value of "3") engaged in computer-based activities at their jobs or in their studies, for hobby or leisure activities, for financial purposes, for educational purposes, for finding information, and for communication with

Table 6.1-3

Descriptive Statistics for Pre-Task Questionnaire Items Asking How Often Learners Use a Computer for the Following Purposes

Pre-task Questionnaire item	Median	Mean	St. Dev.
at your job/in your studies	4	3.67	0.47
for hobby or leisure activities (e.g., playing games, downloading music)	3	3.22	0.65
for financial purposes (e.g., banking, shopping)	3	3.11	0.75
for educational purposes (e.g., completing assignments)	4	3.56	0.5
as an information source (e.g., to find information/research)	4	3.56	0.52
for communication with friends or family	3	3.33	0.5

Note. N= 11. All response scores based on a Likert-scale where 1= never and 4= always.

friends and family. All Medians for the responses to each of the items were either “4” or “3,” with Means ranging between 3.11 and 3.67. The relatively low Standard Deviation values (all less than 1.00, with a 0.75 value being the highest Standard Deviation) show there was less strikingly wide variation among the reported Likert-scale values.

Table 6.1-4 shows a breakdown of participants’ individual answers to each of the question items. Analysis of the responses shown in this table allows for a more close investigation of the participants’ unique uses of computers for the described purposes. As can be observed from Table 6.1-4, there is no considerable variation in the frequency with which participants use computers for the designated purposes. All participants marked they either “always” or “sometimes” use computers at their jobs or in their studies, for educational purposes, for locating information, and for communicating with friends and family. Only one participant (P7) marked she only “rarely” uses computers for hobby or leisure, two participants (P5 and P11) responded they use computers “rarely” for financial purposes, while all other participants reported they “sometimes” or “always” use computers for both of the mentioned purposes.. Participants 1, 4, and 9 reported they “always” engaged in computer use for all of the specified activities. Participant 5, interestingly, noted she “always” engaged in each of the activities, but only “rarely” used the computer for financial purposes. Other participants (P6, P7, and P11) did not report they “always” engaged in any of the specified activities, but primarily marked they “sometimes” used the computer for the listed purposes. The remaining participants (P2, P3, P8, and P10) reported a combination of “always” or “sometimes” using the computer for the described tasks.

Table 6.1-4

Individual Participant Responses on Pre-Task Questionnaire Items Asking How Often Learners Use a Computer for the Following Purposes

Pre-task Questionnaire item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
at your job/in your studies	4	4	4	4	4	3	3	4	4	4	3
for hobby or leisure activities (e.g., playing games, downloading music)	4	3	3	4	4	3	2	3	4	3	3
for financial purposes (e.g., banking, shopping)	4	3	3	4	2	3	3	3	4	4	2
for educational purposes (e.g., completing assignments)	4	4	4	4	4	3	3	3	4	4	3
as an information source (e.g., to find information/research)	4	3	4	4	4	3	3	3	4	4	3
for communication with friends or family	4	3	3	4	4	3	3	3	4	3	3

Note. N= 11. All response scores based on a Likert-scale where 1= never and 4= always.

The final pre-task questionnaire item pertaining to learners' technological literacy elicited information about participants' comfort level performing several computer-based tasks. The descriptive statistics summarizing the group's responses to the Likert-scale items are provided in Table 6.1-5.

Table 6.1-5

Descriptive Statistics for Pre-Task Questionnaire Items Gauging Learners' Comfort Level Performing the Following Tasks

Pre-task Questionnaire item	Median	Mean	St. Dev.
learning new technology	3	3.27	0.9
using computer-based language learning tools	3	2.82	0.98
solving problems you encounter when using the computer	3	2.91	0.94

Note. N= 11. All response scores based on a Likert-scale where 1= not comfortable at all and 4= very comfortable.

Median values for each of the items gauging participants' comfort levels learning new technology, using computer-based language learning tools, and solving problems encountered while using a computer were all 3, and Mean values ranged between 2.82 and 3.27. The Standard Deviation values for each of the items were all between 0.90-0.98, indicating variation in the participants' individual responses to the items. A breakdown of the responses by participant is provided in Table 6.1-6 to gain a better understanding of the ways in which learners' comfort levels varied.

An investigation of individual learners' reported comfort levels performing the listed tasks shows a number of discrepancies between how comfortable different participants feel accomplishing certain technological activities. Two participants (P4 and P9), for example, felt very comfortable (as indicated by a marking of "4" on the Likert-scale) performing all of the tasks, while one participant (P7) did not feel comfortable at all (as indicated by a

Table 6.1-6

Individual Participant Responses on Pre-Task Questionnaire Items Gauging Learners' Comfort Level Performing the Following Tasks

Pre-task Questionnaire item	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
learning new technology	4	3	3	4	3	3	1	4	4	4	3
using computer-based language learning tools	4	2	3	4	3	2	1	2	4	3	3
solving problems you encounter when using the computer	2	3	3	4	2	3	1	3	4	4	3

Note. N= 11. All response scores based on a Likert-scale where 1= not comfortable at all and 4= very comfortable.

marking of "1" on the Likert-scale). It is also worth noting that Participant 7 was the only of the 11 participants to report a "1" ("not comfortable at all") for any of the listed tasks, though some participants reported comfort levels of "2" ("slightly comfortable") for some of the defined tasks. This variation shows that, among the group of 11 participants, some are much more at ease learning new technology, using computer-based language learning tools, and solving problems encountered when using the computer.

Though three participants tended towards the highest or lowest values on the Likert-scale in their reports of comfort levels performing the stated technological tasks, more participants were less extreme in their report of comfort levels or marked an assortment of comfort levels for the particular tasks. Two participants (P3 and P11) marked they were "comfortable" performing all the designated tasks, and both Participants 2 and 5 marked they were either "slightly comfortable" or "comfortable" performing all the tasks, not marking comfort levels of either "1" or "4" on the four-point Likert-scale. Other learners marked feeling "very comfortable" performing some, but not all tasks. Participant 1, for example, was "very comfortable" learning new technology and using computer-based language learning tools, but was only “slightly comfortable” solving problems using the computer. Participant 10 was also “very comfortable” learning new technology and solving problems encountered when he uses a computer, but was just “comfortable” using technologically based language learning tools. Participant 8’s comfort levels were the most widely varied, with the learner reporting he was “very comfortable” learning new technological applications, just “comfortable” solving problems he encounters when using the computer, and only “slightly comfortable” using technological language learning software.

In terms of the specific questionnaire items, there was some consistency in learners’ individual reported comfort levels using technology. Not taking into account Participant 7, who marked she was “not comfortable at all” performing any of the listed tasks on the computer, responses to the first Likert-scale item showed that the remaining ten students were either “comfortable” (as indicated by a marking of “3”) or “very comfortable” learning new technology. Other Likert-scale items, however, received more of a diversity of responses on comfort levels. Three participants (P2, P6, and P8) reported they were only “slightly comfortable” using computer-based language learning tools, and Participant 7 again reported she was “not comfortable at all” using the tools. The remaining participants reported they were “comfortable” (P3, P5, P10, and P11) or “very comfortable” (P1, P4, and P9) using the computer-based language learning tools. While no participants besides Participant 7 reported they were “not comfortable at all” performing solving problems they encounter when using a computer, two learners (P1 and P5) both reported they were only “slightly comfortable” (as indicated by a marking of “2”) solving problems that arise during computer use. Three participants (P4, P9, and P10) were “very comfortable” and five participants (P2, P3, P6, P8, and P11) were "comfortable" when they had to solve problems that occurred while using the computer.

What is clear from findings from the quantitative data analysis for RQ3a is that learners were varied in some of the types of computer activities they engaged in and their stated frequency of use of technology. For instance, some participants had never used a computer language before, and one always does. Also, most participants had never created a website, but two reported they created websites "sometimes." As a whole, participants reported less experience using computer programming languages and using AWE applications. Some students, however, seemed simply more involved in computer-based tasks. A few participants reported "always" engaging in all of the activities, with others reporting they "sometimes" or "rarely" accomplished the designated activities.

Despite the variation in activities participants had engaged in with computers, the purposes for using technology seemed quite similar, with most learners reporting frequently using a computer, installing a program on a computer, creating Word documents on computers, conducting research using computers, manipulating graphics and pictures on computers, using various word processing functions, and using Powerpoint. Situations for technology use were also alike in the participants' self-reports of their computer use, with learners commonly using computers at their jobs or in their studies, for hobby or leisure activities, for financial purposes, for educational purposes, for finding information, and for communication with friends and family. That the participants reported similar uses of and contexts for computer use is not surprising considering the similarities among the sample group populations. All participants in this study are graduate students and, to execute their many roles as students, researchers, and possibly teachers or teaching assistants in their programs, they are required to create and give presentations, search for literature in digital repositories, conduct research using computers, and write up their research findings. The likeness in reported situations of use thus seems a reflection of similarities among members of the sample group of participants.

Participants' responses concerning contexts of and purposes for computer use signals the extent of their technological literacy, the learners' capabilities to solve problems and communicate the solutions with technologies (McCade, 2001; Rossiter & Watters, 2000). Development of technological literacy is likely a requisite in the participants' enactment of the social roles they fulfill as graduate students and novice research writers. Resnick and Wirt (1996) maintain that technological literacy is connected to professional literacy and an individual's workplace duties and responsibilities. Employees in the modern age are required to learn and apply technology to accomplish required tasks and communicate competently in their professions. Thus, the resemblance in participants' reports of the activity types and purposes of computer use reflects similarities in the technological literacy skills expected of them as graduate students and novice researchers and writers in their disciplines.

It is not entirely surprising that most participants reported little to no use of computer-based language learning resources, including AWE tools. It is probable that the participants may have never had the opportunity to use CALL applications in their language learning prior to taking the workshop course on advanced academic writing for graduate students. While the learners may be literate using certain technological applications, that technical competence does not necessarily translate into successful exploitation of CALL tools for first or second language development (Jones, 2001). It is thus important to gauge learners' prior experience with a range of technologies, including CALL applications and AWE software, prior to implementing the tools into writing instruction.

With regards to learners' noted perceptions of comfort, it is not unexpected that participants' reported comfort level learning new technology, using computer-based language learning tools, and solving problems encountered when using the computer are varied considering learners' differing current and previous experiences with technology. For example, two of the participants who reported always being engaged in the specified tasks were the most comfortable using technology. The connection between frequency of use and comfort level using technology is well documented in the literature. Namely, heightened frequency of use of various technologies assists in alleviating computer anxiety, an emotional reaction associated with projected negative consequences of computer use (Chua, Chen, & Wong, 1999), and lessening users' negative attitudes towards technology (Heinssen, Glass, & Knight, 1987). The same type of negative affective reaction felt about computer interactions could be said to be applicable to any technology interaction, as users may experience similar fears about hypothesized failures in technology use; thus the term could be expanded to encompass computer *and* technology anxiety.

Decreased comfort levels and high computer/technology anxiety are harmful in human–computer interactions because they diminish technology users' ability to perform tasks with the applications; this is due in part to the mental exertion of participants who feel anxiety, as they must expend cognitive resources to deal with their anxiety instead of concentrating these efforts on successful execution of the learning assignment (Kanfer & Heggestad, 1997). Specifically regarding use of AWE software, the impact of such technology-oriented anxiety has been shown to influence some language learners to prefer human feedback to automated feedback (Lai, 2010). In terms of this dissertation research, study participants who report higher computer/technology anxiety, which could be related to their reports of low comfort levels, may struggle to accomplish draft revision with the RWT because their mental energy is directed towards dealing with their negative emotional responses to using the new technology and not towards writing improvement.

Previous research has further shown that technology users who have had more prior experience with computers distinguish themselves as having high computer self-efficacy (Harrison & Ranier, 1992; Hill, Smith, & Mann, 1987). Determining students' computer self-efficacy, or the technology users' perceived proficiency for accomplishing the designated computer-based tasks (Sam, Othman, & Nordin, 2005), is critical for instructors who are integrating CALL applications, because how confident learners feel about their computer abilities has broad influences over other aspects of the student–computer interaction, such as learner perceptions of control of the technology (Sproull, Zubrow, & Kiesler, 1986), success in accomplishing tasks with the CALL tool, opinions about the CALL application or activities using the technology (Busch, 1995; Zhang & Espinoza, 1998), and willingness to work with the technology in the future (Compeau & Higgins, 1995). Though writing instructors are unable to regulate their students' technological literacy or background experience with computers, appraising the students' computer self-efficacy early in the course, and developing appropriate measures to address the apprehension through supplemental training or individualized support, may help mitigate technology-associated anxieties prior to the introduction of the RWT or other CALL tools.

Yet higher self-efficacy is not necessarily always equated with increased use of new technologies (Sam, Othman, & Nordin, 2005; Seyal, Rahman, & Rahim, 2002). As Compeau and Higgins (1995) caution, learners' prior technological experience may guide them to believe the new technology is easy; as a result, students who report elevated self-efficacy may apply little effort when learning the new technology and neglect to explore the full extent of the program's features. Because consistently high reports of comfort levels using and learning new technology cannot be unquestionably considered positive, RWT users' reports of moderate levels of comfort learning new technology and solving problems with computers should not automatically be regarded as a negative finding.

Qualitative Analysis for RQ3a

Results from an analysis of learner responses to an open-ended response item on the post-task survey and stimulated recall questions pertaining to RQ3a show that learners perceive their background experiences with technology and computers as influencing their interactions with the RWT in a number of ways. Specifically, an analysis of learners' responses to the question in the open-ended post-task survey and stimulated recalls asking "How do you think your background experience with computer-based tools has affected your interaction with the RWT?" yielded a number of themes in participants' responses. The following report of findings is broken up into the codes raised by study participants in response to the specific question on the impact of learners' background experience with technology on their RWT experience. Numerical tallies of the codes are reported in the following section wherein quantitative and qualitative data are triangulated.

No impact from computer experience. One theme which emerged from the data was learners' belief that their background experience with computer-based tools had no influence on their interaction with the RWT. Only one participant (P6) made mention of the lack of impact from previous technological experiences. When asked if she thought her background experience with computer-based tools affected her interaction with the AWE tool, Participant 6 remarked “I don’t think so, because it’s been over five years since I used [another AWE tool].” What is clear from this response is that the learner interpreted the phrase “computer-based tools” to mean specifically another “AWE tool” she had referenced earlier in the stimulated recall. This response does not, however, speak specifically to whether or not Participant 6 believed her background in technology as a whole affected her use of the RWT.

Computer experience affecting attitudes towards computer-based tools. Another theme in the open-ended survey responses and stimulated recalls regarded the impact of past computer experience on learners’ current attitudes towards technological tools. Most of the connections made between learners’ technological background and their present attitudes towards technology involved participants’ positive opinions of computer-based tools. Participant 1 made a number of links between her background experiences with technology, including AWE programs and CALL tools, and her current positive attitudes towards technology. When asked if her background experience with language learning technology had any impact on how she perceived computer-based tools, Participant 1 responded “It absolutely had a positive effect on me, and “This, my positive attitude to these technological tools absolutely has a positive effect.” The same learner later noted, in her stimulated recall, that “since I have been involved in the research of computer-based tools, I have a positive attitude towards them.” This participant’s inclusion in research on technological tools thus seemingly influenced her to have more positive attitudes towards computer-based tools.

Yet past experiences with technology also were mentioned as stimulating negative attitudes towards computer-based tools. Participant 7, for example, stated “My natural discomfort with new technology likely influenced my overall view of the program.” This learner obviously has previously felt uncomfortable exploring new technology, and this discomfort negatively affected her perception of the RWT.

Computer experience increasing curiosity about RWT capabilities. Past experience with computers also impacted one participant's curiosity about the RWT and the tool's potential. Participant 1, who, as can be recalled from previously reported findings, had had previous experience with, and conducted research on, language learning technological tools, remarked "I was very curious about the capabilities of RWT," when asked about how computer experience affected her RWT experience.

Computer experience increasing interest in RWT feedback. Similar to participants' computer experience affecting curiosity about the RWT's functions, computer background experience also was connected to learners' increased interest in the RWT's output. The same participant (P1) whose background experience with computers impacted her positive attitudes towards computer-based tools and her curiosity about the RWT's capabilities, also connected her previous experience with technological tools to her increased interest in the RWT feedback. In the open-ended survey responses, Participant 1 responded to the question about how her background experience with computer-based tools affected her interaction with the RWT saying "Therefore, I read each comment it gave me."

Computer experience increasing interactivity with RWT. Participant 1 also related her background experience with technology to her increased interactivity with the RWT. "And I gave feedback to it as well," Participant 1 stated in an open-ended response to the post-task survey item asking about background computer experience impacting learners' RWT experience. This response shows that the learner provided more feedback to the RWT (in the form of giving a “thumbs up” or “thumbs down” to the analyzed sentences) due to her previous experiences with computer-based tools.

Computer experience affecting perceptions of ease of use. Past experiences with computer-based technology were cited as impacting perceptions of both difficulty and ease using the RWT. Most participants remarked that no matter their technological experience, the RWT was easy for them to use. Participant 3, for example, commented, “I am vaguely familiar with computer software and the software was dummy proof enough for me,” and “It was easy to use it with little effort.” The same participant also said, “I’m not the most techno-savvy person, so in that respect I think the tool is easy to use,” relating the fact that, though he felt he was not technologically skilled, he still found the RWT “easy to use.” Finally, at the end of his stimulated recall, Participant 3 said “Even someone with my limited skillset could figure it out and benefit from it,” again referencing the fact that though he did not consider himself to be highly technologically capable, he still believed participants like him could both find the tool useful and understand how to use it. Participant 2 also made many comments about how easy it was for her to use, such as “It is an easy tool to use for me,” “I think it is pretty intuitive,” and “I think the tool is quite easy to use.” Another learner, P8, also felt that other RWT users who had less experience with computers would not find it difficult to use, responding “It’s not a real complicated program, so I think that it wouldn’t be very difficult for people that aren’t very familiar with computers.” Participant 9 also believed that background experience with computers was not necessarily a prerequisite to having clear and easy interactions with the RWT, sharing “This is the first software I’m using, this one, and it’s very straightforward to use it, I think.”

Yet some of the same participants who remarked about technological experience not being required to operate the RWT without difficulty also commented that having some background with computers would be helpful or necessary. Participant 8, for example, said "As long as you have a little background with computers, I think it's pretty easy to use." Participant 2 also made a projection about others who may have less of a technological background finding the tool more difficult to use, stating "I think if I put myself in the shoe of someone who's not very comfortable with technology, I maybe encounter difficulty." Another participant, P6, echoed this sentiment, saying "Students that are my age are just like, 'Oh, but I hate computers. They're so difficult to work with.' You just have to get experience." All of these participants' responses reflect a feeling that indeed some previous experience with technology would be helpful for being able to interact easily with the RWT for draft revision.

Computer experience affecting ability to navigate RWT. A not entirely unrelated code connected to learners' computer experience impacting their perceptions of ease of use of the RWT as a whole is the theme in participants' responses concerning past technology use affecting RWT users' ability to navigate the tool. Many participants thought their background experience with technology helped them as they navigated the tool, enabling them a sense they could operate the AWE tool as if using the RWT use were intuitive. Participant 5, for instance, remarked "I think what I knew about using tools for teaching with technology helped me understand how to use RWT," suggesting her previous experiences teaching with technology helped her figure out how to use the AWE program. Participant 9 agreed that technological experience helped her smooth use of the tool, mentioning "I think the previous computer-based tools that I have used help me to use RWT more easily."

Finally, Participant 1 claimed that her background experience with AWE programs and CALL tools “is just helping me” as she uses the RWT.

At times, the participants were specific about what particular features of the RWT they found especially easy to understand or navigate as a result of their background experience with computer-based tools. “At least I knew how to agree with the RWT sentence evaluation,” Participant 10 stated, pointing to a specific type of RWT interaction that was facilitated more easily due to his background experience with technology. When asked whether her background experience with technology or technological tools may have affected how she interacted with this tool, Participant 5 responded, “Yes, basically, because I know how to move from one page to the other,” and immediately followed up this statement saying, “So if I don’t have that initial knowledge, then it would be difficult for me to navigate.” The same participant then commented, “If I don’t know how to write, to type, to edit, to analyze, to scroll down when I want to do that, that would be bad” in terms of easily using the AWE program. Participant 5 then asserted that “Somebody who has a little bit of computer literacy. You cannot just give it to anyone, because you would not be able to navigate it,” implying someone with limited technological experience would not know how to move from one page to another.

Computer experience affecting time required to become familiar with RWT. Coinciding with learners’ ability to easily use and navigate the RWT is the theme in learners’ responses connecting background experience with technology and the time learners need to familiarize themselves with the RWT. Several student comments centered on learners’ desire to have more time to “figure out” the RWT. Participant 4 remarked “I think I need to try more times to figure out how it works better for me,” while Participant 6 stated “I think that probably the idea that like you could come back to this later, and figure out how it works." Participant 6 also expressed a desire to put more time into exploring the tool in a different context (home), commenting "I can do this at home with my text and kind of play with it"; the same student even gave a justification for why she wanted to "play with" the RWT at home, declaring "Like I really do want to learn how to use this, because it would be very convenient." Still another learner (P3) remarked on the importance of time when learning a new technology, saying "I use enough technology to know that I'm going to struggle with it at first; once I become familiar with it, if I become familiar with it, it's easy to use." From this quote, we see that Participant 3 recognizes his own style of learning: the struggle with the new technology at the onset of being introduced to it, then eventual familiarization with the tool, which occurs through experience using the tool. This time spent using the tool in turn affects Participant 3's perceptions of how easy the tool is.

Computer experience affecting time required to develop writing skills using with RWT. Not only did learners mention that past computer experience related to the time needed to become familiar with the RWT, but also that previous computer use impacted how efficiently a student could use the tool to improve writing skills. When responding to the question about how background technology experience impacted her experience with the RWT, one participant, Participant 9, stated "I can develop my skills faster than I expect" using the RWT.

Computer experience affecting ability to exploit RWT features. Past computer experience was linked by participants not only to perceptions of ease of use and navigability of the RWT, but also to students' ability to exploit the features of the AWE tool. Participant 7 said, "Technology is not one of my areas of strength. And so I very likely wasn't able to use it to its full extent or as effectively as someone who had greater experience with technology or is more comfortable with technology." This quote signifies Participant 7 was attributing her restricted ability to exploit the RWT's capabilities to her limited technology experience and, therein, as she draws the connection, seemingly lower level of comfort using computer-based tools.

Computer experience affecting confidence working with RWT. Another theme mentioned by RWT users linked their experience using computers to the confidence they had when using the RWT for draft revision. Participant 6, for example, believed that her experiences with computer-based tools helped her be fearless in her use of the RWT, stating, "I've had a lot of experience with technology at this point, so I wasn't afraid to use it or anything." The same learner followed up this remark saying, "I think it's like my boss and stuff like that, he'd probably think, I don't know, 'It's a computer thing. I don't want to.'" The learner was, therefore, not only relating her extensive background experience to her being unafraid of working with the AWE program, but also connecting her boss's presumable lack of intense background experience with computers to his reluctance to use such "a computer thing."

The development of confidence when working with new technology may also take time. "I tend to, when I'm learning something new, it takes me a long time to develop any confidence," Participant 7 claimed. This statement alludes to the fact that Participant 7 requires more experience with a particular new piece of technology to acquire confidence using the tool. The same participant also cited another variable influencing an increase in her confidence using the RWT; "If the computer was confirming my work, it was boosting my confidence to a certain extent," suggesting that when the RWT gave feedback she agreed with, or feedback which confirmed her own intended rhetorical meaning of a sentence, she gained confidence in the tool.

Computer experience affecting reliance on RWT. The same participant who expressed that it took time for her to grow confidence in a new technology also declared that until she felt any feelings of certainty with what she knows, she tends to depend on the technology. Participant 7 commented, “When I’m learning something new, it takes me a long time to develop any confidence in what I know, so I’m more likely to rely on a tool.” In this statement, the learner is appraising her own knowledge of the subject matter and connecting her degree of confidence in what she knows with her reliance on a computer-based tool. Also, one major supposition underlying this quote is the connection between the learner’s assumption that technology, in effect, “knows better” than the technology user what the writing is intended.

Considering all mentioned influences from participants’ technological background, we can attempt to make meaning of results concerning learner perceptions of their computer experiences as impacting their RWT interaction. Firstly, the view that previous computer experience had no impact on learners’ RWT interactions may possibly derive from the misunderstanding of the question prompt. In Participant 6’s response that she did not think background experience with technology affected her RWT interaction, she remarked about the length of time which had lapsed since her last interaction with another AWE program. From her statement, it seems the participant misinterpreted the question about past experience with “computer-based tools” to signify strictly other AWE tools. What can also be gleaned from this statement, however, is the participant’s connection of the interval of time between her last experience with an AWE tool and her RWT interaction and the possible effect this had on her RWT experience; this drawn connection raises important questions about how the length of time between initial experiences with new technology impacts a learners' experience with the RWT or other CALL applications.

Most learners, however, did connect their past use of computer-based tools to possible influences on their RWT experience. As referenced earlier in this section, technology users' past experiences with computer-based tools have been shown to impact their computer self-efficacy as well as attitudes towards technology. According to Oliver (2001), the extent of learners' technological literacy, as impacted by their past experiences with computer-based tools, affects student readiness, or their receptiveness to learning and using new technology. Understanding students' past experiences with computers and extent of technological literacy may help writing instructors more accurately project how prepared the novice writers are to integrate the RWT or other AWE programs into formative assessment of their writing.

Considering that learners' technological literacy has been observed to impact users' readiness for using new technology, it seems reasonable that participants also associated their past computer experience with both perceptions of ease of use and abilities to navigate the RWT and exploit RWT features. In the results, participants cited background experiences using CALL and AWE programs, either in teaching or learning contexts, as helping them navigate the RWT for draft revision. It makes sense that students' prior usage of language learning technology or technology as a whole, which possibly improved their comfort level learning new technological systems, would help learners identify not only the function of RWT features, but also how to maneuver between and through RWT modules in accessing feedback. Still, RWT navigability did not seem to be inhibited by participants' limited technological experience. Whether or not the RWT users cited the need for much technological experience to find the RWT easy to use, no participant stated that an extensive background with computers was necessary to use the AWE program. In other words, as Participant 3 remarked, the tool was still easy to use despite some students' lessened computer experience.

One learner also cited that her curiosity about the functioning of the RWT was impacted by her previous experiences with computers. Perhaps this participant's prior experience with technology made her curious, because of her awareness of the great potential of the technology as witnessed in interactions with similar computer-assisted language learning software, a point the learner mentioned in her stimulated recalls. Learner curiosity about the RWT and RWT functioning can be seen as a positive finding in review of past research on the role of curiosity in learning new technologies. Arone, Small, Chauncey, and McKenna (2011) argue that curiosity can be a catalyst promoting a new technology user's investigation of the computer-based context and resolution of her insecurities interacting with the new program. The authors further regard curiosity as holding the ability to stimulate enhanced learner autonomy and competence during use of the new system. By contrast, excessive curiosity may overwhelm users as they navigate and learn new technology by distracting them with more input than they can possibly process. To encourage an appropriate amount of curiosity among new users of a technology, Arone et al. (2011) propose keeping students "purposefully engaged" (p. 182); writing instructors' assignment of meaningful draft revision tasks, perhaps through specification of small, attainable goals when introducing the AWE program for the first time may help in promoting learner inquisitiveness about the tool.

Participants' reported interest in the RWT and RWT feedback as resulting from their background using computers can also be perceived as a positive finding. Like the already discussed importance of curiosity in computer programs, Arone et al. (2011) have also observed interest in technological applications as connected to constructs of curiosity in and engagement with the technology; that interrelation of curiosity and interest in the RWT is affirmed in this study's data, as the same participant (P1) who cited intense interest in the RWT and RWT feedback —which she described through a narration of her close attention to every comment the RWT provided on her draft's analyzed sentences— also cited heightened curiosity about the AWE program. Educational research has repeatedly shown that students' level of interest in learning materials positively impacts the degree of learning, though little research has aimed to understand how and why this interest develops (Hidi & Renninger, 2006). Examining writers' prolonged use of the RWT, possibly through studies of continued semester-long use of the program for formative writing development, may reveal factors contributing to how and why RWT users' interest in the tool increases.

The influence of computer experience on the amount of time learners need to become familiar with a program, a variable cited by study participants, is also backed by like findings from research in second language learning. In this dissertation, some learners mentioned feeling they needed more time to become comfortable using the RWT, explore the range of RWT functions available, and learn how to best develop writing skills with the RWT, concerns they connected to their restricted background experience with technology. Grimes (2008) and Grimes and Warschauer (2010) have also observed that language learners require time to familiarize themselves with and practice exploiting features of new AWE technologies for effective formative writing development. It would be essential that writing instructors provide sufficient time for learners to become familiar with the RWT as they make modifications to their RA section drafts.

Extended periods of interaction with a new AWE technology are not only beneficial for the language learners, but also for the writing instructors. In order to recognize the full scope of potential for AWE software, writing teachers need time to first adapt to using the tools themselves, then learn to take risks in exploring how the AWE program features can be most successfully employed in the writing classroom (Grimes & Warschauer, 2010). Prolonged interaction with AWE software further boosts writing instructors' positive opinions of a tool, which in turn impacts learners' opinions of and trust in the tool (Chen & Cheng, 2008). Therefore, instructors should allot adequate training time for both themselves and their learners to adapt to and examine ways to effectually use new AWE technology to develop writing proficiency.

Past research findings also support the current study's results linking previous computer experience with the degree of confidence a learner has in using a new CALL program. Leahy (2008) and Oliver (2001) are among the many scholars who insist that students' confidence during their computer-mediated interaction is strongly tied to their technological literacy. Novice writers' extensive background experience with technological tools can heighten the learners' confidence in their RWT interactions and additionally help foster autonomous learning as the novice writers explore the program, feeling assured and positive about their experience (Warschauer & Grimes, 2008).

Another impact from experience with computers that was mentioned by participants and recognized in prior language learning studies regards learners' reliance on AWE programs. Participant 7's comment that the "technology knows better" implies her belief that the RWT is more knowledgeable about her writing or more capable of determining how she should improve her draft; a harmful consequence of conceiving of an AWE program as more adept at suggesting revisions is that the user may place a disproportionate amount of faith in the automated feedback. While it is important to foster user trust in a learning technology, over-trust may transform into user dependence on automation (Lee & See, 2004). As Madsen and Gregor (2000) propose, users of new technology are particularly susceptible to developing over-reliance on an artificially intelligent system when they are less familiar with the content. Following this reasoning, study participants using the RWT for the first time may be more prone to developing over-trust in and/or over-reliance on the AWE program, as they are less experienced writers, novices to writing in the research writing. Applying suggestions from HCI research on trust in and reliance on artificially intelligent systems (Lee & Sanquist, 2000; Lee & See, 2004) to findings from this study, it is of paramount importance that appropriate trust in and reliance on CALL applications is encouraged from the onset of language learners' use of a new program so users remain conscious of the technology's capabilities and limitations and maintain responsibility for and ownership of their own language development.

Triangulation.

A triangulation of the data answering RQ3a shows the prominence of some particular cited impacts from learners' previous computer experience. In particular, computer background experience was most frequently mentioned by learners to impact their perceptions of how easy it was to use the RWT, their ability to navigate the AWE tool, and the time required to become familiar with the tool. The following data triangulation first presents the quantitative tallies of the presence of codes emerging from each of the qualitative data sources regarding participants' perceptions of the effect of technological experience on their RWT interaction. A discussion of these results in juxtaposition with the results of the quantitative analyses of learners' responses on the pre-task questionnaire follows.

Table 6.1-7

Numerical Tally of Codes Emerging from Participant Responses by Qualitative Data Source

Codes	Open-ended survey responses	Stimulated recalls	Total
No impact from computer experience	0	1	1
Computer experience affecting attitudes towards computer-based tools	2	2	4
Computer experience increasing curiosity about RWT capabilities	1	0	1
Computer experience increasing interest in RWT feedback	1	0	1
Computer experience increasing interactivity with RWT	1	0	1
Computer experience affecting perceptions of ease of use	4	9	13
Computer experience affecting time required to become familiar with RWT.	1	5	6
Computer experience affecting time required to develop writing skills using with RWT.	1	0	1
Computer experience affecting ability to navigate RWT.	3	5	8
Computer experience affecting confidence working with RWT.	0	4	4
Computer experience affecting reliance on RWT.	0	1	1
Computer experience affecting ability to exploit RWT features.	0	1	1
TOTAL	14	28	42

Table 6.1-7 shows the numerical tallies of the open-ended response codes emerging in responses to the question about how learners believed their background experience with technology impacted their RWT experience. Tallies from the stimulated recall data and open-ended survey response data were calculated and are reported in this table. From the table, it is the evident the most commonly occurring code in both qualitative data sources was computer experience affecting perceptions of ease of use of the RWT (with 13 total instances). Other frequently reported codes emerging from participants' responses about their background experience with technology affecting their RWT interaction were computer experience affecting the learners' ability to navigate the RWT (with eight total instances), computer experience affecting time required to become familiar with RWT (with six total instances), computer experience affecting attitudes towards computer-based tools (with four total instances), and computer experience affecting confidence working with RWT (with four total instances).

Table 6.1-8

Summary of Overall Percentage of Each Code Compared to Other Codes in Qualitative Data

Codes	Percentage of code
No impact from computer experience	2.4
Computer experience affecting attitudes towards computer-based tools	9.5
Computer experience increasing curiosity about RWT capabilities	2.4
Computer experience increasing interest in RWT feedback	2.4
Computer experience increasing interactivity with RWT	2.4
Computer experience affecting perceptions of ease of use	31
Computer experience affecting time required to become familiar with RWT	14.2
Computer experience affecting time required to develop writing skills using with RWT	2.4
Computer experience affecting ability to navigate RWT	19
Computer experience affecting confidence working with RWT	9.5
Computer experience affecting reliance on RWT	2.4
Computer experience affecting ability to exploit RWT features	2.4

To more precisely recognize the presence of each code in participants' responses regarding their perceived impact of technology as impacting their RWT experience, an itemization detailing the frequency of occurrence of each code in the qualitative data is useful. Table 6.1-8 depicts a summary of the percentage each code was present in the qualitative data as compared to the occurrence of other codes; in other words, the table shows how often learners mentioned each code concept when discussing how they believed technology as having impacted their experience with the RWT.

What is shown in Table 6.1-8 mirrors the tallied codes displayed in Table 6.1-7; percentages of the presence of each code in the qualitative data clearly point to what participants found as being affected most by their background experience with technology. Namely, computer experience was noted by more learners to impact participants' perceptions of ease of use of the AWE tool, ability to navigate the RWT, time required to become familiar with the RWT, attitudes towards computer-based tools, and confidence working with the RWT. Figure 6.1-1 below shows a graphic representation of the distribution of codes in the qualitative data answering RQ3a. Each piece in the pie chart represents the percentage of a code in comparison to the sum of overall codes in participant responses about previous technological experience as impacting their RWT interaction.

Findings from the data triangulation further elucidate earlier reported qualitative codes concerning participants' use of the RWT as impacted by their background experience with computers. From Figure 6.1-1 it is apparent which processes, abilities, and reactions learners' cited most in discussing the impact of their background experience with computers

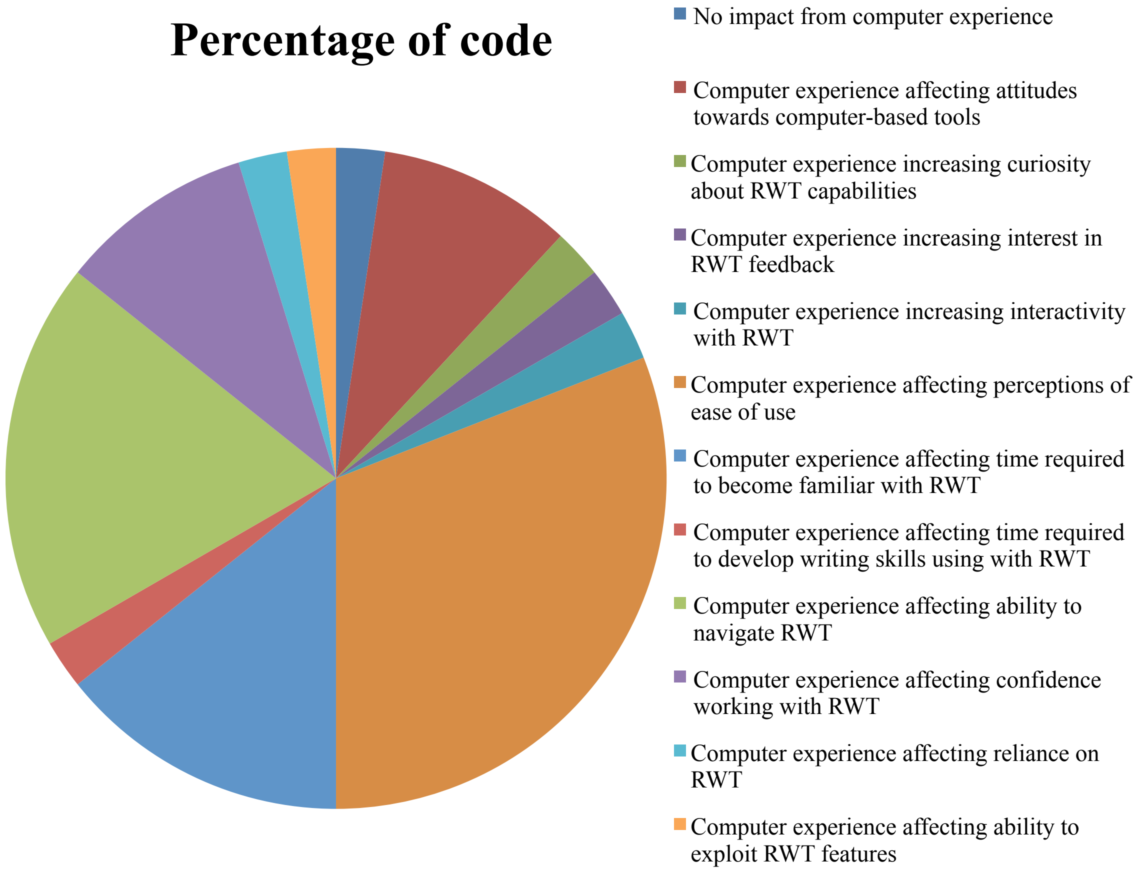


Figure 6.1-1. Depiction of overall percentage of each code in participants' responses in the qualitative data

on their RWT experience. As already revealed in the preceding tables, it seems the participants felt their computer experience mostly impacted how they perceived the RWT to be easy to use. Not unrelated to perceptions of ease of use is learners' perceived ability to navigate the RWT (i.e., actually use the RWT). Yet another large piece of this pie chart comprises codes for computer experience affecting participants' attitudes towards computer-based tools, not just the RWT. Less frequently cited impacts from learners' background experience with computers include increasing interest in RWT feedback, curiosity about RWT capabilities, and interactivity with RWT, time required to develop writing skills using the RWT, reliance on the RWT, ability to exploit RWT features, and even no impact from background experience at all.

By discussing the results of the combined qualitative data sources in conjunction with findings from the quantitative analysis answering RQ3a, we are able to observe some potential connections between the experiences learners reported were impacted by their computer literacy and learners' markings on the pre-task questionnaire about how frequently they use computers and in what contexts as well as their comfort levels for interacting with computers and technology in different ways. For example, learners heavily cited that their perceptions of the RWT's ease of use were impacted by their background experience with computers. Participants' past usage of computers involved markings of "always" or "sometimes" with regards to commonly engaged in activities, such as use of Word documents and Powerpoint, and use of the computer for conducting research. Though many participants (P3, P7, P8, P9, P10, and P11) had created a website, and three (P1, P2, and P6) stated they "rarely" did, participants reported more frequent involvement in other computer-based activities; installation of computer programs, manipulation of graphics or pictures, and use of Word processing capabilities, to name a few, were prevalent activities reported among participants, with no participants remarking they had "never" accomplished these tasks, and one to two participants per item remarking they only "rarely" completed these tasks. Reflecting on the results from RQ1a and RQ1c, which revealed learners' general perception that the RWT was not difficult to use, in conjunction with learners' connection of past computer experience with opinions about the RWT's ease of use, it seems learners considered their technological background adequate enough to promote few usability difficulties in their RWT interaction.

Participants' reported ability to exploit RWT features may be related to their prior experience with technology and comfort level working with and learning new technology. In the Likert-scale question items on the pre-task questionnaire, two participants (P4 and P9), for example, felt very comfortable performing all of the tasks, while one participant (P7) did not feel comfortable at all. The same participant who reported the lowest comfort levels was also the learner who marked most often she had "never" engaged in several of the specified computer-based tasks (creating a website, using computer languages, using computer-based language learning or AWE tools). In the qualitative data analysis, again Participant 7 was the only learner who mentioned her limited technological experience as impacting her ability to exploit RWT features. Immediately after proclaiming that technology was not a strength of hers, Participant 7 remarked, "So I very likely wasn't able to use it to its full extent or as effectively as someone who had greater experience with technology or is more comfortable with technology." From this quote, we observe the learner making a direct connection between her background technological expertise and comfort performing technological tasks to her capabilities to fully exploit RWT features effectively for her draft revision. The literature supports the notion raised by Participant 7 connecting technological literacy with abilities for handling and fully taking advantage of new technological environments (Leahy, 2008). Leahy also suggests that learners with limited technological proficiency experience more complications processing the automated feedback. It may be that Participant 7's low comfort levels using technology and lack of extensive computer experience affected her ability to exploit the RWT to its full capacity and, as a result, also negatively impacted her use of the automated feedback in her draft revision.

Student confidence when working with the RWT could be connected to the participants' reported comfort levels and background computer experience as well. On the pre-task questionnaire, all participants marked they either "always" or "sometimes" use computers at their jobs or in their studies, for educational purposes, for locating information, and for communicating with friends and family. Only one participant (P7) marked she only "rarely" uses computers for hobby or leisure, two participants (P5 and P11) responded they use computers "rarely" for financial purposes, while all other participants reported they "sometimes" or "always" use computers for both of the mentioned purposes. Furthermore, most participants reported they were "comfortable" (P3, P5, P10, P11) or "very comfortable" (P1, P4, and P9) using computer-based language learning tools. No participant, besides Participant 7, reported she/he was "not comfortable at all" solving problems encountered on the computer; three participants (P4, P9, and P10) were "very comfortable" and five participants (P2, P3, P6, P8, and P11) were "comfortable" when they had to solve problems that occurred while using the computer. The high degree of comfort solving problems on the computers and using computer-based language learning programs may elevate their confidence in using the RWT for draft revisions; future research on the RWT should aim to better understand the connections between comfort levels using technologies and learner confidence in the AWE tool.

From the results of this data triangulation, it may also be interesting to further explore the potential relationship of confidence in and reliance on the RWT. Participant 7, the learner who was the least comfortable using technologies and the least experienced with computer-based tools, commented that her technological literacy impacted both her confidence in and reliance on the RWT. As previous HCI research confirms (Lee & Sanquist, 2000; Lee & See, 2004), technology users' past computer experience affects how willing individuals are to act on an artificially intelligent system's supplied recommendations. Dangerously, over-reliance on technology may contribute to a lack of critical consumption of a system's feedback and trusting an automated program's suggestions to the point of human detriment (Sparaco, 1995). A better understanding of the balance of confidence in and reliance on an automated tool and its relationships to learners' technological literacy will help writing instructors using the RWT or other AWE tools for writing development facilitate appropriate levels of learner trust in the analyzer's feedback.

Learners' also appeared to link their comfort level using computer-based tools to their attitudes towards or perceptions of the RWT. Participant 7 made this connection explicit, stating, "My natural discomfort with new technology likely influenced my overall view of the program." It follows to reason that learners who feel uncomfortable using or learning new technologies would also experience stress when using the RWT and, because of the stress-inducing experience, possibly develop less favorable attitudes towards the AWE tool. Prior to the use of the RWT in writing classrooms, it will be necessary for instructors to, as Grimes (2008) and Shi, Reeder, Slater, and Kristjansson (2004) assert, understand their students' preparedness for using the automated systems and assess the best means for using the AWE program so it facilitates language improvement while not generating feelings of anxiety among the novice writers.

Learners' background experience with computer programs, and especially with CALL applications, may have impacted their curiosity about and interest in the RWT features. For instance, Participant 1's inquisitiveness about RWT functioning may have been a result of her more intensive experiences with AWE tools and CALL programs (as indicated in her pre-task questionnaire responses). In other words, having used CALL or AWE programs in her own language learning experiences, or possibly in language teaching contexts, may have increased Participant 1's desire to know more about the RWT's capacities.

Participants' previous experiences using language learning technologies may also associate with their increased interaction with certain RWT features. Just as Participant 1 expressed strong curiosity and interest in the RWT's features and functioning, she also reported aims to provide extensive feedback to the RWT analyzer in the thumbs up/down/neutral markers; she connected all of these variables to her background experience with computers. The learner rationalized her objectives for providing much feedback to the RWT as rooted in wanting to improve the AWE tool; possibly because of her previous experiences with AWE or CALL technologies, Participant 1 was aware the more feedback she provided to the RWT, the more improvements could be made to the system or analyzer. McCade (2001) holds that technology users' enhanced technological experiences may contribute to increased ability to develop strategies for using and solving problems with technology. The participant's previous experience with technology may have aided in not only developing strategies for interacting with the RWT, but also prompted her to consider more complex issues, such as how the system functions and how to improve the AWE tool.

This triangulation of the findings from analyses of the data shows what may be construed as a pattern in how comfort levels using technologies and background experience with computers impacted study participants' RWT interactions. Namely, a potential pattern emerges in an examination of accounts from participants located on both ends of the spectra for previous computer experience and comfort levels using technology. Participant 1 and

Participant 7 represent the extremes in their report of minimum (P7) and maximum levels (P1) of comfort using technology and computer literacy (in comparison to reported values by other study participants). Taking into consideration Participant 1's RWT experience, it could be projected that the more comfortable with technology and experienced a learner is in working with computers, the more curious she is about the program and interested she is in the tool and its functioning, and the more interactive she is in providing feedback to the tool. By contrast, reflecting on Participant 7's RWT experience, the less comfortable a learner is using computerized tools or less experience she has with particular technology, especially CALL or AWE systems, the lesser the ability she has in exploiting RWT features, the lower confidence she has using the RWT, and the greater the tendency becomes to rely on the system's feedback. These two sample student profiles may characterize patterns in RWT users' background experience and comfort levels using technology as influencing their RWT interactions; on the other hand, these two students' experiences may simply be outstanding examples of the extremes on both ends of the spectra for reports of learners' computer experience and comfort using technology. Further research incorporating larger populations of students using the RWT is required to discern whether these trends are truly representative of new users' experience with the RWT for RA section draft revision.

Collecting self-report information about learners' comfort levels using technologies as well as their past and current uses of computers allows language learning instructors and researchers to obtain a reference for learners' background technological experience (Oliver & Towers, 2000; Rimrott & Heift, 2005; Shi, Reeder, Slater, & Kristjansson, 2004). This information is highly beneficial in deciding what and how CALL or AWE applications should be incorporated into class instruction (Rossiter & Watters, 2000). Applying knowledge of language learners' readiness to interact with new AWE programs like the RWT will also help writing instructors better adapt their pedagogy to fit the needs of individual learners, lending appropriate support to individual learners as they use automated feedback to develop their written drafts.

Section 6.2. RQ3b-Influence of additional learner variables on RWT interaction

A combined qualitative and quantitative analysis was conducted to answer RQ3b — *What other learner variables do participants perceive as impacting their interaction with RWT?* The description and tally of codes emerging from the qualitative data are provided after the executive summary.

Executive Summary

An analysis of learners' post-task survey responses and stimulated recalls revealed participants perceived several learner variables impacting their draft revision experience with the RWT. Specifically, learners considered variables such as discipline of study, availability of instructor, cautiousness during RWT use, native speaker status, format of the RA text, preference for feedback, stage in the research write-up process, desire for visuals, personality, familiarity with Moves and Steps, and imagined disability as potentially influencing their RWT draft revision. Comprehensive descriptions of these code categories as well as a discussion of what the findings mean in light of research in the field of applied linguistics and human–computer interaction follows.

Qualitative + quantitative analysis for RQ3b.

A qualitative analysis of learners' responses to open-ended items on the post-task survey and stimulated recalls revealed that participants thought their RWT experience was indeed impacted by a number of learner variables. Several themes, turned into codes, emerged from participants' responses to a question about what learner variables they perceived as impacting their RWT interaction. While some of these themes may not necessarily be conceived of exactly as “learner variables,” as was targeted by this research question, they were included in answering RQ3b, because they were given as responses to the question asking what other learner variables participants perceive as affecting their RWT interaction. (All responses relating in any way to learners’ background experiences with computers or technology were included in answering RQ3a on the impact of technological experience on the RWT interaction). The following provides an identification and description of the codes and integrates direct participant quotes from the data.

No learner variables. In the open-ended survey, one participant (P1) cited that no other personal characteristics impacted her RWT experience, saying directly, “I don't think there are other characteristics that might have affected my experience with RWT. Again in the stimulated recalls, when asked what learner variables may have impacted her draft revision with the RWT, Participant 1 replied “none.” Participant 1 was the only learner who noted that no learner variables (outside of background experience with technology, addressed in RQ3a) impacted her RWT experience.

Discipline of study. The most commonly occurring learner variable participants mentioned as affecting their RWT experience was their discipline of study. In the post-task survey, when asked about potential learner variables (aside from technological background) which may have influenced her RWT interaction, Participant 5 said “Maybe my program of study, too, because what I study was not in RWT's disciplines and this might have given me different results in my own program of study.” In this response, the “RWT’s disciplines” refers to the disciplines represented in the RWT database and which could be selected by RWT users to perform a cross-analysis with their drafts. A survey response by Participant 6 also alluded to the RWT lacking her discipline: "I think that having examples in my area would be great" (P6). In her stimulated recall, Participant 2 also commented on the lack of Demonstration Module examples in her discipline, suggesting, "Maybe it was confusing to see that there's no examples." Participant 7, too, emphasized the lack of representation of her discipline in the RWT database, remarking, "In many instances there were no examples from the fields of the closest match to mine, and it would take several tries to find a field that was even remotely related that would have an example." It is thus clear from learners' responses that the absence of corpora representing the participants' disciplines of study was a factor that seemingly negatively impacted their RWT interaction and/or the draft revision process. The representation, of lack thereof, of students' disciplines in the RWT corpus is discussed later in this section with respect to how the inability to conduct a cross analysis with learners' exact discipline could positively instead of negatively impact learners' interactions with the AWE program.

Availability of instructor. Another potentially influential variable cited by three different learners was the availability of the instructor. In the open-ended survey responses, Participant 3 wrote, "It helped to have the instructor available to address the questions that I did not know the answers to regarding the software use." This quote implies that Participant 3 used the course instructor to clarify misunderstandings or provide guidance during his RWT draft revision. In response to a question in the stimulated recalls asking what potential learner variables may have impacted her RWT interaction, Participant 6 responded, "The idea that like learning to use it while you guys are around and figuring out how it works." "You guys," in this quote, refers to having someone present to assist first-time users of the

RWT with navigating and understanding uses of and for the software.[9] Also, Participant 10 mentioned the instructor's presence during the initial use of the RWT, stating, "I mean, even the advisor, she could be busy." In this statement, the "advisor" references the instructor of the course; from this response, it could be viewed that Participant 10 felt that if the instructor were busy or unavailable to assist him in his RWT interaction, it may impact his RWT interaction. It is clear from these responses that a few participants thought having the instructor available or unavailable during their initial use of the RWT had an impact on their experience with the AWE program.

Cautiousness during RWT use. One participant remarked, "I think I am just being careful," (P4) when asked about what other learner variables may have impacted her RWT interaction. This student was expressing that she was exercising cautiousness as she interacted with the RWT tool, perhaps a common occurrence when the learner uses new technology.

Native speaker status. In response to an open-ended survey question asking what learner variables may have impacted the learners' experience with the RWT, Participant 5 wrote, "Maybe because English is not my native language I was not able to use RWT like English speakers do. English speakers could know how to interpret the suggestions better." This participant felt her status as a non-native speaker of English negatively affected her RWT experience, believing that native speakers may have an advantage of more easily understanding the RWT feedback and/or how to apply it. This statement also suggests that Participant 5 struggled to understand the RWT's suggestions for her draft revision. No other

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[9] The researcher did not interact with or assist the participants during their RWT draft revisions. However, because of her presence in the room and interest in the learners' RWT experiences, some participants may have been perceived her as being knowledgeable about the functioning and uses of the AWE tool.

NNSs mentioned their status as L2 learners of English as impacting their draft revision with the RWT.

Format of RA text. In her open-ended survey response to the question about the impact of other learner variables on RWT experience, Participant 6 noted, “Also the fact that I have formatted text which didn't go through made it difficult to read my text.” This learner perceived the “format” of her text as having influenced her draft revision with the RWT; that the text “didn’t go through” the analyzer suggests the tool’s inability to process parts of the text itself or possibly misinterpret characters or symbols in the text. However, what specifically the participant conceives of as “format” is unclear. The “format” could potentially refer to structure or organization of her Introduction section, the style of her text, or the physical formatting (such as inclusion of special characters or figures). Participant 6’s quote implies the “format” of the learner’s text negatively affected her RWT experience, as it seemingly produced difficulties in how the program “read” the text.

Preference for feedback. In the open-ended question on the post-task survey, two participants noted their particular preferences for feedback as a learner variable which may have influenced their RWT experience. “My tendency to prefer ‘black and white’ information may have influenced my views of how beneficial the program was versus what was lacking in the program,” Participant 7 noted. This quote does not point to whether the learner perceived this preference for “black and white” feedback as positively or negatively influencing her perception of the helpfulness of the RWT. Participant 10 also commented, “Because I was looking for a specific feedback, I think it was helpful.” Interestingly, both of these learners highlighted their desire to have specific, straightforward (“black and white”) feedback on their drafts. Also similarly, both Participant 7 and 10 related these preferences for direct feedback to their perceptions of how beneficial they perceived the RWT to be.

Stage of research write-up process. Responding to a post-task survey question asking participants about learner variables which they think may have impacted their RWT experience, one learner (P10) stated, “I think it’s more helpful when you already have data that you are working on.” According to this statement, Participant 10 believed that RWT users who already have conducted research and have results (data) would find the RWT, and possibly the experience of using the RWT for draft revision, more helpful.

Desire for visuals. In the stimulated recalls, two participants referred to the presence of visual feedback being a positive feature influencing their RWT experience. “Visual cues are important so you can grasp the concept,” Participant 2 noted, suggesting the inclusion of visuals assisted her interpretation of the RWT feedback. The learner followed up this statement, saying “I’m not a good reader, so I rely on visual images.” “And it gives, for example, the pie chart is very important for me, because the website is colorful, so it’s very important for me,” Participant 9 remarked, calling attention to the importance of visuals (both the pie chart and the presence of color in the RWT feedback) to her effective understanding of the feedback. Participant 9 also replied, “So the design and everything is very natural, so I like the design of the website software, no problems,” in response to the question about other learner variables impacting her RWT experience. It seems that both Participant 2 and Participant 9 are learners who value visual feedback and seemingly, the inclusion of RWT feedback in graphical, color-coded form enhanced their RWT draft revision experience.

Personality. Some participants referenced personality characteristics as factors which may have potentially influenced their RWT interaction. Participant 7 remarked, "My perfectionism may have influenced my views of how beneficial the program was versus what was lacking in the program." This comment implies that Participant 7's high standards for not only herself, but also the software she uses; in other words, Participant 7's high expectations of the program prior to her RWT interaction may have had an impact on her perception of its benefit to her or others. In the stimulated recall, Participant 4 twice directly mentioned the word "Personality" as a possible influential factors in her RWT draft revision.

Familiarity with Moves and Steps. In the stimulated recalls, two learners mentioned that a RWT user's familiarity with the Moves and Steps of the targeted research article section may have an impact on the RWT experience. "When it matched with actual course content, it boosted my confidence in the computer," Participant 7 responded to the question about possible learner variables impacting her RWT experience. This comment may perhaps imply that when the student's understanding of the Moves and Steps introduced in the course ("actual course content") aligned with what the feedback the RWT presented from an analysis of her draft, her confidence in "the computer" (the RWT) increased. Participant 11 also cited knowledge of Introduction section Move/Step schema as potentially impacting his RWT experience, commenting, "Because also the software reminded me of the structure of the Introduction, tell me what should, what information may be missing." It seems Participant 11 perceived the RWT as "reminding" him of the structure of Introduction sections, which somehow then affected his RWT experience.

Possible disability. In the stimulated recall, one learner mentioned a potential disability that could impact someone's experience with the RWT. When asked what learner variable may have affected his RWT experience, Participant 8 replied, "What if you were color blind?" Though this participant does not have this disability, he cited color blindness as a factor that could impact an RWT users' experience with the tool. This was likely mentioned as a variable which could have a negative impact on how a RWT user deciphers the feedback, because much of the feedback in the Analysis Module as well as examples available in the Demonstration Module are color-coded; someone who experiences difficulties discerning colors would perhaps not as easily interpret the feedback. (Assistance features are in place in the RWT for users with such disabilities. For example, pop-up boxes identifying each Move and Step appear as RWT users hover over the annotated, color-coded sentences.)

Table 6.2-1 shows a summarized tally of the number of mentions of each code in learners' responses in the stimulated recalls and post-task survey data.

Table 6.2-1

Numerical Tally of Codes Emerging from Participant Responses by Qualitative Data Source

Codes	Open-ended survey responses	Stimulated recalls	Total	Percentage of code
No other characteristics	1	0	1	4
Discipline of study	3	2	5	20
Availability of instructor	1	2	3	12
Confidence in the process	1	0	1	4
Native speaker status	1	0	1	4
Format of RA text	1	0	1	4
Preference for feedback	2	0	2	8
Stage of research write-up process	1	0	1	4
Desire for visuals	0	4	4	16
Personality	1	2	3	12
Familiarity with Moves/Steps	0	2	2	8
Possible disability	0	1	1	4
TOTAL	12	13	25	100

From Table 6.2-1 it can be observed that the most commonly occurring code (with five total instances) in the qualitative data sources is discipline of study, meaning learners most commonly identified their fields of study as a variable impacting their RWT experience. Other variables learners more regularly cited as affecting their RWT interaction were their preference to learn and improve their writing with the use of visuals (with four total instances), their individual personalities (with three total instances), and whether or not the instructor was available to assist them during their interaction (with three total instances). Learners' preference for a certain type of feedback and the participants' familiarity with Moves and Steps were also cited more than once (with two total instances of each) by participants as having an impact on their RWT interaction.

Table 6.2-1 also provides the overall percentage breakdown of each code the combined data comprising participants' responses to what learner variables may have impacted their RWT experience. The percentages of the presence of each code as compared to the occurrence of other codes in learners' responses to the question about what other learner variables may have impacted their RWT experience are the highest for discipline of study (20%), desire for visuals (16%), personality (12%), and availability of instructor (12%). Those variables that were only cited once (constituting 4% of the overall 25 mentions of variables) by participants as impacting their RWT interaction were cautiousness during RWT use, native speaker status, format of the RA text, stage of research write-up process, possible disability, and no learner variables. Figure 6.2-1 below is a pie chart showing the distribution of codes in the qualitative data. Each piece in the pie chart depicts the percentage of the designated code in comparison to the percentage of other codes in participants' mention of the learner variables impacting their RWT interaction.

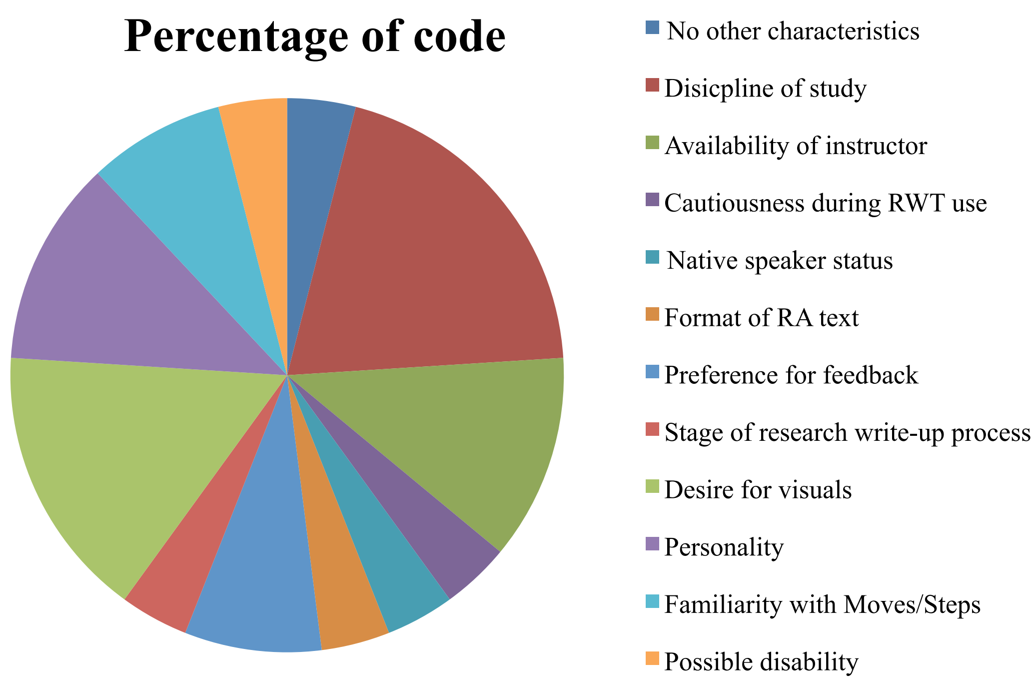

Figure 6.2-1. Depiction of overall percentage of each code in participants' responses in the qualitative data

Again, from Figure 6.2-1 it is apparent which variables learners cited more or less frequently as impacting their RWT interaction. Some of the variables which were more frequently cited by learners as impacting their RWT experience could be roughly grouped into like categories. The learners' personality and cautiousness, for example, are unchangeable aspects of the learner, relating both to the nature of the person. The availability of the instructor rests on a variable external to the learner — whether or not someone more knowledgeable about the tool is there to guide the participants. The desire for visuals and preferences for feedback type relate to learners' inclinations to respond more favorably to particular feedback or feedback in particular formats. By contrast, learners' familiarity with Moves and Steps pertains to content knowledge (knowledge of the genre conventions of Introduction sections taught in the course) and learners' abilities to recognize and apply that knowledge.

Discipline of study was a learner variable that participants commonly cited as influencing their RWT interaction. While a number of learners perceived the lack of their precise discipline in the RWT corpus — both for purposes of cross-analysis in the Analysis Module and for searching published examples of Moves and Steps in the Demonstration Module — as having a negative impact on their RWT experience, the absence of participants' exact program of study may not have necessarily diminished the writers' draft revision experience. As Biber et al. (2007) contend, corpora that are not matched precisely to the learners' disciplines "discourage students from viewing the corpus results as providing the single 'right answer'" (p. 36). Instead, using corpora in the same genre but perhaps not in the exact discipline fosters learners' cultivation of advanced concordancing strategies for extracting then recognizing and interpreting language of the genre. If study participants had the ability to access a corpus specifically matched to their discipline, it may have promoted a harmful reliance on the RWT for supplying the "right answer," or a rigid formula for what the learners may perceive they "should" accomplish in their writing; the participants may have interpreted the RWT analyzer's feedback on their section draft as being absolute and in turn blindly applied the feedback, not questioning the applicability or usefulness of the revision suggestions. Not having the precise discipline may have additionally served to promote the adoption of differing approaches for examining lexicogrammar and structures of their own RA section drafts (in the Analysis Module) as well as those of published works in their disciplines (in the Demonstration Module).

Previous researchers have observed the influence of the instructor on language learners' CALL program experiences, a variable study participants also cited as impacting their RWT interaction. Chen and Cheng (2008) argue that the timing and style of writing instructors' implementation of AWE tools undoubtedly influences how language learners use the tools as well as how they develop perceptions of the tool's effectiveness. The authors warn that use of AWE software without proper instructor guidance or supervision may frustrate students and even foster development of negative reactions to the AWE program. Myers (2003), Cotos (2011), and Hyland (2003) all claim that instructors can provide critical in-process assistance to language learners during their AWE tool interactions; the temporal and spatial immediacy of the instructor during in-class drafting stages with the RWT could thus help the novice writers to the research article genre grow strategies for identifying strong and weak points in their writing as they access, interpret, and incorporate RWT feedback. While it may not be feasible to offer every student in the class individual one-on-one help, determining how and when instructors should intervene to support students' writing development will help foster the most effective use of AWE programs for formative purposes (Heift, 2007).

Learners' cautiousness about using the RWT may have been brought about by a number of internal learner qualities or environmental circumstances external to the student. Lai (2010) has observed that the anxiety students bring with them to a CALL program interaction may make language learners cautious during their experience with the computerized tool, in succession potentially affecting learners' eventual preferences for human feedback over the automated feedback. In terms of the contextual variables, the format, delivery, or accuracy of the automated feedback may have influences on participants' reactions to an AWE tool (Shute, 2008), including tentativeness about accepting the feedback for draft revisions. Follow-up research investigating the contextual conditions or learner attributes which may have prompted learners' cautiousness during their RWT interactions could help clarify sources of the carefulness so instructors may understand how to develop learners' appropriately cautious behavior their use of the RWT.

Not surprisingly, non-native speaker (NNS) status was also described as a factor potentially influencing participants' draft revision with the RWT. This is a finding corroborated by second language learning scholars who have enumerated the struggles NNSs confront in their academic discourse development. In addition to having restricted linguistic resources to draw on in constructing discourse, L2 learners of English must identify the appropriate genre of a communicative situation and adapt their language to varying contexts of TL use (Schleppegrell, 2001). Reproducing academic discourse, a challenge even for native speakers (NSs), not to mention NNSs, requires writers to summarize and argue, make connections between theory and practice (Leki, 2007), and transform their knowledge in a way that is acceptable to members of their discourse community (Tardy, 2005). This can be a painstaking and perhaps seemingly insurmountable task for many L2 learners. Though AWE tools like the RWT strive to promote the development of language learners' knowledge of and writing in the research genre, it is possible that using the software for the first time presents NNSs greater difficulties than NSs, maybe through the RWT's presentation of more, and a greater variety of, L2 input to interpret; because all RWT feedback is in English, NNSs could experience cognitive overload in attempting to improve research writing in their L2 while also navigating new software delivered in the medium of their L2. Understanding the differences in needs between non-native and native English speaking writers using the RWT as they work to expand their knowledge of academic genre conventions and evaluate how their writing conforms to the generic expectations should be a foremost goal of future research in studies of the RWT so the NNSs and NSs alike may benefit equally from use of the technology.

Additionally, learners' preference for feedback, an aspect participants mentioned as influencing their RWT experience, is an important area of research into CALL and AWE programs that should be explored in further usability research and research on learner perceptions of the RWT. Understanding how learners prefer to receive feedback may allow developers of automated systems to assemble learner personas, prototypes characterizing the preferences, traits, and goals of larger groups of the technology's users (Heift, 2007). Compiling detailed learner persona profiles will help interactional technology developers build learning environments that are more individualized for the unique learners as well as aid writing instructors in determining means for personalizing RWT or AWE program use in drafting stages (Chen & Cheng, 2008).

The development of learner personas could be substantially enhanced through explorations of participants' individual characters and temperaments. Study participants also reported personality attributes as impacting their RWT interactions. According to Shute (2008) and Chen and Cheng (2008), learner factors such as intrinsic motivation, ability to learn independently, metacognitive capacity, and opinions about a specific technology or technology as a whole may affect students' use of AWE tools for writing improvement. Close monitoring of writers' continued use of the RWT for improving their research writing and knowledge of research genre conventions as well as persistent collection of learner reflections on their RWT experiences may be helpful means for teasing out learner personality influences on AWE program use; this new information could enrich learner persona development for advanced AWE tool design and implementation in writing instruction.

Some participants' mention that familiarity with Moves and Steps seemed to impact their RWT experience suggests that learners using the RWT in the future should definitely receive orientation to the communicative functions prior to working with the tool for draft revision. RWT developers have urged that writing instructors familiarize their language learners with the section-specific Moves and Steps prior to use of the tool for formative assessment of the students' drafts; knowledge of a section's communicative goals and strategies for achieving these goals helps the language learner not only understand the available linguistic choices for realizing functions in the lexicogrammar at a sentence-level (Swales, 2002), but also how the writing fits within a broader context of scholarly communication in a larger disciplinary community (Flowerdew, 2005). Study participants' identification of the importance of genre knowledge is therefore a positive finding which points to the language learners' awareness about the RWT's purpose: facilitating writers' critical exploration of the function of discourse in the research genre and thoughtful application of the RWT feedback to enhance rhetorical meaning.

In addition to the variables learners cited as impacting their AWE tool interaction, researchers in HCI, applied linguistics, and education cite the need for considering further variables, specific to the learner, the computer-based tool, and the learning context, when examining influences on writers' RWT draft revision experience. In terms of learner attributes, Dörnyei and Skehan (2003) suggest that students' emotional involvement in their CALL tool interactions influences how learners engage with the technology and the extent of language acquisition which occurs. How the language learners use the system's feedback for formative writing evaluation as well as learners' personal motivation to improve their writing, are additional variables which Hyland and Hyland (2006) recommend should be investigated as possible influences on learners' experiences with AWE programs. Students' past practice reading or producing writing in the genre and previous experience conducting research in the discipline may also impact students' behaviors as they interact with the RWT. Regarding context-specific characteristics, Pujola (2002) asserts that the convenience of the computer-mediated learning environment impacts how students utilize the program's help options. Hyland and Hyland (2006) maintain that feedback features, such as accuracy, relevance, and method of feedback distribution, may all affect the learners' use of the CALL applications. Further studies of the learner-specific and learning context-specific variables that may shape the novice writers' experiences revising written RA section drafts with the RWT will enhance researchers' and writing instructors' awareness of important factors to consider in the AWE program's pedagogical uses.

Section 6.3. Summary of Findings for RQ3a-b

To summarize the findings from analyses answering RQ3, learners cited numerous aspects of their previous technological experience and other learner variables as impacting their use of the RWT for draft revision. A breakdown of individual participants' use of and comfort levels using computers for certain tasks and in some specified contexts reveals some learners were simply more proficient in their computer use and felt more comfortable working with and learning new technology. Learners also regarded their technological experience as having multiple impacts on their RWT experience, including how confident participants felt using the tool and how able they were to exploit the tool and navigate its features. Additionally, learners reported variables like discipline of study, format of the RA text, and cautiousness during use of the AWE tool as influencing their use of the RWT for Introduction section draft revision.

In direct response to RQ3a— *How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?*— it seems learners perceived their background computer experience as influencing their use of the RWT in a number of ways. A quantitative analysis of learners' responses to pre-task questionnaire items eliciting information about their engagement in and comfort levels performing particular computer-based activities revealed diversity among technological backgrounds of participants in the group. While most participants reported frequent use of computers for such activities as word processing, use of Powerpoint, and manipulation of visual graphics, and in situations like at their jobs, for educational purposes, and for hobby or leisure, more variation existed in learners' reported activity regarding use of computer languages, construction of websites, and use of language learning technologies. Comfort levels performing technology tasks also differed in the participant group, wherein some learners felt "very comfortable" solving problems encountered in computer interactions and learning new technology, and others felt "not comfortable at all" or "slightly comfortable" performing the tasks. Learners also cited multiple impacts from their computer experience as affecting their RWT interaction. Among the most commonly cited impacts were technology experiences' effect on their perceptions of the RWT's ease of use, their ability to navigate the RWT, time required to become familiar with the RWT, their confidence working with the RWT, and the attitudes they developed towards the AWE tool. Because technology users' comfort levels impact their successful execution of the learning assignments (Kanfer & Heggestad, 1997) and may influence language learners' propensity to disregard AWE feedback or prefer human to automated feedback (Lai, 2010), instructors should understand learners' background experience with computers prior to integrating CALL applications in language learning contexts.

Results for RQ3b —*What other learner variables do participants perceive as impacting their interaction with the RWT?* — show that participants recognized several learner variables as affecting their interactions with the RWT for draft revision. In analyzing learners' post-task survey responses and stimulated recalls, it was shown that participants believed such learner variables as discipline of study, availability of instructor, cautiousness during RWT use, native speaker status, format of the RA text, preference for feedback, stage in the research write-up process, desire for visuals, personality, familiarity with Moves and Steps, and imagined disability as having affected their use of the RWT. Discipline of study was most the commonly cited variable impacting learners' RWT interactions, followed by the variables presence of the instructor, desire for visuals, and personality. While writing teachers may not be able to change or shape some of these learner variables, instructor guidance during students' first-time use of the RWT could help ensure the AWE program is used effectively for formative purposes as learners make revisions to their RA section drafts (Heift, 2007).

Altogether, results from analyses answering the set of questions in RQ3 showed learners' recognition of multiple variables as impacting their RWT revision experience. Whether these variables were intrinsic (e.g., personality or native speaker status) or experience-based (e.g., experience creating websites, past use of computer languages), it is critical writing teachers understand the impacts on student interaction with a new CALL technology to facilitate effectual exploitation of the application for language development.

CHAPTER 7. CONCLUSION

At a time when institutions in higher education strive to implement instructional practices and curricula that are both effectual and cost-effective (Oliver, 2001), when writing instructors struggle to maintain their increasing workload while still providing meaningful, individualized feedback to their students (Cotos, 2010; Ferris, 2003), and when NS and NNS graduate students aspire to develop conventions of writing in the academic genre (Huang, 2010), automated writing evaluation tools hold enormous potential for meeting the needs of students and instructors in the university writing classroom. This dissertation study aimed to explore how one AWE tool, the Research Writing Tutor, was used by graduate students to develop their research writing skills, with hopes of gaining greater understanding of how learners use and perceive their use of the program and the program's feedback in their writing development. Not only does this research carry implications for informing the RWT developers of possible improvements to the tool, but it may also bring to light valuable information for designers of other AWE and CALL applications, and provide insight into effective pedagogical applications of AWE software in academic writing instruction.

This dissertation represents the first of its kind in scholarship exploring user interactions with and perceptions of an emerging AWE tool. One novel aspect of this study concerns its unique emphasis on learner perceptions during AWE program interactions. Though many have investigated language learners' use of AWE software (e.g., Chen & Cheng, 2008; Cotos, 2011; 2012; Grimes & Warschauer, 2010; Schroeder et al., 2008; Shermis et al., 2004; Shute, 2008), researchers have overstressed "the product," or the linguistic output that presumably represents the language development which occurred during learners' use of the AWE system (Escudier et al., 2011). However, in their exclusive focus on the output of these student –AWE interactions, the means by which learners develop strategies for their writing improvement as they interact with the technology have been largely ignored. This dissertation study diverged from such past research on AWE tools by considering “the process” by which language learners experienced the program, as well as the learners’ perceptions of how the program did and could better facilitate development of their knowledge of and writing in the research genre.

The depth to which this study examined learner perceptions of an AWE tool is unparalleled in previous AWE scholarship. Not only were learner perceptions addressed in this dissertation, but they were also intensely and systematically examined in great detail. This dissertation used inductive coding, as well as Systemic Functional Linguistic frameworks for methodically investigating subtle nuances in participants’ evaluations of their RWT experiences. The analyses yielded a wealth and richness of data previously unassessed in past studies on language learners’ interaction with AWE tools.

This study is also pioneering in that it targets learners’ evaluation of a developing, rather than already developed, AWE tool. Previous researchers have solely examined AWE systems, such as Writing RoadmapTM 2.0 (Wang & Wang, 2012), MyAccess (Warschauer & Grimes, 2008) or Glosser (Calvo & Ellis, 2011), only after the software has been fully developed. Because the RWT is still under development, this study is distinctive in that its results can have immediate impact on the design and development of the program. Learners’ recommendations for modification of current or inclusion of additional RWT features can be promptly applied by RWT developers to enhance usability of the program and increase its effectiveness in facilitating language learners’ research writing development.

Section 7.1. Summary of Findings

Prior to presenting this dissertation's implications and limitations and proposing potential directions for future research, a summary of responses to this study's research questions may help provide a brief review of chief findings and their meaning. This section further serves to re-orient the reader to the study objectives so the findings may be more appropriately contextualized in the broader scope of research in the field. Table 7.1-1 provides a concise summary of the research questions and their corresponding analyses, primary findings from the analyses, and major discussion points related to the results. Short descriptive summaries of the responses to the research questions accompany the table.

To provide a summary of the results for RQ1a-c on learner perceptions of their RWT experience, findings suggest that the participants thought the RWT was useful, and were particularly positive about future potential helpfulness of the AWE program for them and other graduate students when the RWT analyzer's feedback accuracy is improved. Issues of trust in the RWT were frequently connected to the incorrect feedback the learners felt they received from the analyzer, perhaps a result of their expectations for how the program would work or because of tacit comparisons of the automated feedback to human (i.e., instructor) feedback. *Affect* expressed regarding learner trust in the RWT centered on themes of participants' lack of confidence and confidence in the system, and lack of certainty and certainty related to what they believed they were accomplishing in their writing versus what the RWT analyzer feedback suggested. Finally, participants were largely positive in their descriptions of the degree of control they felt when revising their drafts using the RWT, though a few participants' overly negative evaluations of learner control may have distorted the overall group tallies of negative and positive *appreciation* resources.

Table 7.1-1

Summaries of Responses to Research Questions

Research Question	Data Analyses	Principal Findings	Key Implications
RQ1a: *How do learners perceive the usefulness of the RWT?*	Descriptive statistical analysis of post-task survey responses SFL Appraisal analysis of *appreciation, engagement, graduation*, & *affect* resources of post-task survey responses & stimulated recall transcripts	In general, learners: • evaluated the usefulness of the RWT positively • understood the RWT feedback • believed the RWT helped them improve their research writing skills • were prompted to rethink their rhetorical intentions • considered the RWT easy to use • conveyed a mixture of positive and negative emotional responses in their evaluations of the RWT's usefulness • expressed a desire to use the RWT for future draft revisions	Learners' positive evaluation of the RWT's comprehensibility, clarity, functionality, applicability, and usefulness of the tool are crucial factors in users' reception and adoption of new technology (Davis, 1989). Recognized automated feedback inaccuracies could negatively influence writers' use of AWE systems by promoting learner preference for human feedback (Chen & Cheng, 2008). RWT prompting participants to revisit their writing shows the writers' desire to ensure they have expressed their goals clearly in their writing, a fundamental goal of the RWT and a critical variable in learning a genre (Coe, 2002; Hyon, 1996). Students' enthusiasm about the current and future projected states of the RWT may represent learner investment in helping create a program that is useful not only for them, but also other novice research writers.
RQ1b: *To what degree do learners trust the RWT?*	Descriptive statistical analysis of post-	In general, learners: • were hesitant to place complete trust in the RWT	Students' limited interaction with other automated systems may have negatively impacted RWT users' expectations about what

	SFL Appraisal analysis of *appreciation, engagement, graduation*, & *affect* resources of post-task survey responses & stimulated recall transcripts	positive judgments and emotions in discussions of their trust in the RWT • commonly conveyed emotions expressing uncertainty, lack of confidence, and lack of awareness in discussions of trust in the RWT • connected their positive reactions to the RWT to the tool's capabilities and provisions • related their negative reactions of the RWT to inaccuracies observed in the analyzer's feedback	RWT (Lee & See, 2004). Teachers using the RWT and other AWE programs in their writing instruction should integrate the technologies in a way that is supplemental to, not a substitute for, human instruction (Grimes & Warschauer, 2010). AWE feedback inaccuracies may be beneficial in offering students the occasion to return to their writing for more intense examination of their intended meaning (Yang, 2004). Recognition of the RWT's limitations and capabilities may help ensure learners cultivate appropriate levels of trust in and reliance on an automated system (Reeves & Nass, 1996).
RQ1c: *What degree of control do learners perceive they have when using the RWT?*	Descriptive statistical analysis of post-task survey responses SFL Appraisal analysis of *appreciation, engagement,* & *graduation* resources of post-task survey responses & stimulated recall transcripts	In general, learners: • varied in their perceptions of the amount of control they felt they had during the RWT draft revision • mostly perceived they had the ability to accept or reject text modifications recommended by the RWT • were equally divided in their positive and negative reactions to questions about control over the RWT • articulated both the freedoms provided to them and limitations placed on	Learner perceptions of their abilities to accept or reject the RWT's recommended changes may enhance learner autonomy and help them self-regulate their learning experience (Nix & Wylie, 2011). The capacity to manage intake of feedback and control their own pace of learning with the RWT could motivate future use of the RWT (Cotos, 2010; Heift, 2002; Wang & Xian, 2011). Understanding language learners' perceptions of their opportunities to explore and exploit CALL applications provides software developers and designers a better sense of the

		them in RWT interactions	degree of choice learners perceive in their computer-assisted learning process (Heift, 2007).
RQ2a: *How do learners interact with the RWT tool?*	Descriptive statistical analysis of RWT database frequency tallies Inductive analysis of video screen captures Inductive analysis of notes/interview transcripts	In general, learners: • spent the most amount of time interacting with the analyzed color-coded sentences in their texts, exploring Move- and Step-level feedback, and providing feedback to the analyzer justifying their rhetorical intentions • provided strikingly more negative than positive feedback to the RWT analyzer • revised drafts in the RWT text editor and in non-RWT programs (e.g., Microsoft Word documents) • exploited authentic examples of Moves/Steps from published articles to make draft revisions • worked independently and collaborated with classmates	Understanding what RWT features learners use and in what order may alert RWT and AWE tool developers to ways to improve the interface and make feedback more comprehensible and easily accessible (Nielsen, 2012). The presence of the Demonstration Module examples may have provided “visible” rules illustrating what learners’ writing should resemble (Lundell & Beach, 2003). Exploiting examples from the RWT corpus may have prompted learners to take more responsibility in attending to their writing’s syntax, grammar, and coherence by comparing writing in published works and their own texts (Yoon, 2008). Working with classmates to build or clarify their knowledge of the research writing could help learners link known ideas with new concepts in learning the RA genre (Ku, Bravo, & Garcia, 2004).
RQ2b: *What strategies do learners report using in their interaction with the RWT?*	Descriptive statistical analysis of pre-task questionnaire responses	In general, learners: • vary in terms of preferences for working by themselves, with a partner, or with a group • prefer learning new	Preferences for learning new technology with a partner could be attributed to learners’ limited background experience working with CALL tools and their acknowledgement that research writing is a social process requiring interaction with members of a joint scholarly discourse

	Inductive coding of post-task survey responses & stimulated recall transcripts	technology with a partner • reported the use of not one, but multiple interactional strategies for RWT draft revision • identified RWT interaction strategies that could be classified as tool-focused or text-focused • specified strategies that were thought- oriented or action-oriented	community (Schieffelin & Ochs, 1986). Varying foci in reported RWT interaction strategies may imply participants held different priorities in their RWT interactions or that their concerns changed during interactions with the AWE tool. The prevalence of text-focused interactional strategies highlights participants' recognition of their roles as "analysts" in their careful re-consideration of the functional meaning of their writing (Flowerdew, 2005). Allowing RWT users more time to familiarize themselves with the tool's functions will extend their abilities to more successfully apply feedback provided by the tool (Scharber & Dexter, 2008).
RQ3a: *How do learners perceive background experience with computer-based tools as impacting their experience with the RWT?*	Descriptive statistical analysis of pre-task questionnaire responses Inductive coding of post-task survey responses & stimulated recall transcripts	In general, learners: • reported varying degrees of background experience with computers • reported varying comfort levels with respect to use of computers • identified many aspects of RWT draft revisions as impacted by their technological literacy • most commonly cited that their perceptions of RWT's ease of use was impacted	Because technical competence does not necessarily translate into successful exploitation of CALL tools (Jones, 2001), it is important to gauge learners' prior experience with a range of technologies, including CALL applications and AWE software, prior to implementing the tools into writing instruction. Increasing the frequency of use of various technologies will assist in alleviating RWT users' computer anxiety (Chua, Chen, & Wong, 1999) and help lessen negative attitudes towards the tool (Heinssen, Glass, & Knight, 1987).

		past computer experience • perceived their past technology experience also impacted the amount of time needed to become familiar with the RWT and their ability to navigate the RWT	Technology users’ past computer experience affects how willing individuals are to act on an artificially intelligent system’s supplied recommendations (Lee & Sanquist, 2000; Lee & See, 2004). Writing instructors using AWE programs in the classroom should take care in building students’ appropriate trust in, not over-reliance on, an automated tool so learners still engage in critical consumption of the system’s feedback (Sparaco, 1995).
RQ3b: *What other learner variables do participants perceive as impacting their interaction with the RWT?*	Inductive coding of post-task survey responses & stimulated recall transcripts	In general, learners: • perceived several learner variables as impacting their RWT interaction • cited discipline of study as having the most impact on their RWT draft revision • regarded the presence of the instructor, a desire for visuals, and learner personality as other major variables affecting their RWT experience	Though learners remarked that the lack of their discipline in the RWT corpus negatively affected their use of the RWT, Biber et al. (2007) argue that corpora that are not matched precisely to the learners’ disciplines “discourage students from viewing the corpus results as providing the single ‘right answer’” (p. 36). Proper instructor guidance or supervision during learners’ in-class interactions with the RWT could not only help alleviate frustration and discourage negative attitudes towards the program, but also provide critical in-process assistance to first-time users of the AWE tool (Cotos, 2011; Hyland, 2003; Myers, 2003).

In answering RQ2 on learner behaviors and strategies for RWT interaction, a number of both highly individualized and interestingly patterned interactions are revealed. Analyses of learners' screen captures show great variability in the sequence with which learners interacted with particular RWT features as well as the amount of time they spent interacting with those features. It was discovered that learners not only interacted on screen, but also off screen, seeking help from the instructor or communicating with their classmates during their draft revisions. Help features, accessed within the RWT and in external non-RWT Microsoft documents, assisted in learners' verification of their comprehension of Moves and Steps. The writers also took notes on the individualized feedback they received from the RWT on their draft, exploited Demonstration Module examples as they made revisions to their texts, and expressed both positive and negative emotions aloud to classmates and the instructor during their drafts revisions. Findings further showed that learners spent more time on the "needs work" areas the feedback, targeting areas for improvement in their drafts. The assortment of tool-focused and text-focused strategies participants reported using in their RWT draft revisions and the fact that all participants reported use of multiple strategies underscores the complexity of learner interactions with the RWT.

The results answering RQ3 showed participants considered their background experience with technology and other learner variables as impacting their RWT interactions. Not only was there variance in learners' background experience using computers, but also in the participant group's reported comfort levels learning and working with technology. In gauging the frequency of use of some activities, learners reported regular engagement in some activities like word processing, graphic manipulation, creation of tables, and use of Powerpoint, but were, as a group, more varied in their use of AWE and CALL programs, creation of websites, and use of computer languages. The variation in learners' reported comfort levels accomplishing computer-based tasks, such as using CALL software or solving problems with the computer, also differed among group members. Lower reported comfort levels could potentially indicate that some students struggled with RWT draft revision due to the fact they may have focused attention towards dealing with their negative emotional responses to use of the new technology and not towards writing improvement. Learners mentioned many aspects of the RWT draft revisions that were affected by their background experience with computers. Most commonly mentioned variables included influences on learners' attitudes towards the RWT, perceptions of ease of use, time required to become familiar with RWT, ability to use RWT capabilities, and learner confidence working with RWT. RWT users' discipline of study was the most commonly cited learner variable identified as having influenced the RWT interactions. Other learner variables, such as the presence of the instructor, a desire for visuals, and learner personality, to name a few, were also frequently mentioned by participants as affecting their RWT experience. It can be discerned from these results that how language learning instructors introduce AWE tools, the amount of time they provide to familiarize themselves with the programs, and their presence in the classroom to assist during in-process use of the tools affect how students use the tools and the perceptions they develop of the tool's effectiveness (Chen & Cheng, 2008).

Section 7.2. Implications

Implications for research

Findings from this study call attention to the importance of collecting information about language learner's technological literacy levels prior to implementing the RWT, AWE tools, or CALL applications in the language learning classroom. Study participants readily cited numerous aspects of their RWT interactions —the ability to navigate the RWT and exploit RWT feedback, the time required to use the new system for writing development, confidence levels and attitudes towards the AWE tool, and reliance on the program, to name a few —as influenced by their previous computer experience. Because learners perceive so many variables in their RWT interactions as impacted by past technology use, it is critical that writing instructors understand the extent of students' technological literacy before integrating the RWT into RA genre instruction. Language education scholarship (Chen & Cheng, 2008; Rossiter & Watters, 2000) also argues that, in addition to assuring learners' suitable acceptance and usage of new computer-based programs and developing appropriate learner comfort levels using the new technology, teachers' careful consideration of students' technology skills will help the instructor adapt course schedules so proper amounts of time are allocated to learner familiarization with the RWT or AWE or CALL applications.

Additionally, the current research points to the importance of incorporating multidimensional approaches to the teaching and researching of academic writing instruction. Fundamentally, this dissertation investigated language learners' perceptions and use of an automated writing evaluation tool geared to raise novice writers' awareness of research writing genre conventions; to accomplish these study objectives, a merged view of genre that incorporated tenets from the three major perspectives on genre learning —New Rhetoric, English for Specific Purposes, and Systemic Functional Linguistics —was interwoven throughout the study, from providing theoretical underpinnings to interpreting findings from the empirical analyses. A major benefit to genre-based writing instruction and research would be the application of these and other approaches in tandem. This use of multiple perspectives to genre and genre learning would assist researchers and teachers by bringing the focus back to how language is acquired and may perhaps motivate attention to the application of genre knowledge to student writing instruction. Concurrent exploitation of perspectives may also help researchers and practitioners to embrace alternative ways of perceiving genre and students' engagement in academic discourse. Dichotomous views of genre and genre instruction only "threaten to undermine our holistic understanding of writing" (Devitt, 1993, p. 573), so a multi-perspective model becomes a requisite for rich interpretation of genre participation.

Implications for practice

This dissertation further illuminates pedagogical applications of the RWT and other CALL programs in university writing classrooms. Understanding students' both patterned and unique user interaction behaviors as they exploit RWT feedback for draft improvement should prompt writing instructors to be flexible in establishing expectations for how their students use CALL software and employ automated feedback to clarify the meaning in their writing. Being receptive to individual student needs in planning how and when the CALL application is integrated into drafting stages and during in-process uses of the tool encourages student empowerment to develop their own unique strategies for learning with the new technology (Calvo & Ellis, 2010; Chen & Cheng, 2008). Cognizance of how learners practice the academic genre by *doing* (i.e., producing) academic discourse (Dewey, 1966) using the formative writing assessment programs will assist writing instructors' effective delivery of the new technologies and ensure quality and productive CALL interactions among their language learners.

Results from this dissertation also underscore the enormous capacity for corpus concordancing software in language learning. RWT users extensively exploited the Demonstration Module's concordancing tool to search for authentic Move and Step examples realized by published authors in their disciplines, then applied that genre knowledge directly when making revisions to their Introduction section drafts. As opposed to extracting the concordancer results sentences from the surrounding text, the Demonstration Module maintains the examples from the corpus within the original context of the RA section, shown in this study to aid the language learners' awareness of how generic structural rules are applied to fit the situated sociocultural situations of use in the research genre (Freedman & Medway, 1994). Advancements in concordancing software which permit corpus users to access more of the lexical surroundings of the target discourse, preserving the written or spoken data in their social environments instead of stripping the examples from their natural contexts, may help language learners gain heightened recognition of how Moves and Steps are realized by established writers in the disciplines (Hunston, 2002; Widdowson, 2002).

In understanding the development of trust in an automated system and automated feedback, the role of the instructor should not be minimized. A writing instructor's beliefs about an AWE tool impact learner perceptions of the tool's effectiveness, as well as the cultivation of trust in AWE feedback (Chen & Cheng, 2008). If instructors mention little of their own trust in an AWE program, writers may presume the feedback is reliable and, potentially, evolve an exaggerated level of trust in the automated system and feedback (Grimes & Warschauer, 2010). Though the connection between instructor's trust and subsequent participant trust in the RWT was not explicitly examined in this dissertation, the presence and role of the instructor in participants' RWT in-class interaction was repeatedly cited by study participants in discussions of influences on their RWT draft revision experience. Due to a teacher's ability to reinforce or diminish novice writers' trust in AWE programs, student training with the new technology should involve the instructor's distinct elucidation of the tool's expected uses, functions, and existing limitations, as well as actual demonstrations of use of the system.

Implications for design and development of AWE software

Perhaps the most prominent implications of the study results concern modifications and improvements that could be made to the Research Writing Tutor, the AWE program of focus in this dissertation. As this research comprised a usability study of graduate student writers' use of the RWT, the results elucidate learners' successes and failures regarding what and how RWT features were employed for making revisions to their RA drafts. For example, providing the ability to export learner-modified drafts or RWT-analyzed drafts (complete with color-coded, Step-level feedback labels) into Word documents, and clearly marking this available feature, is one suggested revision that would augment RWT users' draft revision experience by alleviating questions of whether the modifications could be later accessed. Realizing the effectiveness or ineffectiveness of particular program features informs how the tool's design and functionality can be adapted to facilitate enhanced writing strategy development for graduate students constructing the research writing genre.

Based on the results of this study, several specific recommendations can be made for improvement of the RWT. The following list represents a distilled set of recommendations derived directly from study participants' responses in the stimulated recalls and in the open-ended post-task survey:

- Development of introductory training materials for new RWT users
- Integration of more help options (e.g., icons facilitating easier navigation among RWT modules)

- Inclusion of enhanced text formatting capabilities in RWT text editor (i.e., bold, italics, underline, color-text features)
- Insertion of RWT usage tips for students whose specific disciplines are not included in RWT corpus
- Incorporation of student ability to change sentence's Move/Step label in RWT Analysis Module to match intended rhetorical meaning
- Addition of enhanced export options to other word processing programs (e.g., Notepad, Microsoft Word)
- Provision of page answering common questions (i.e., regarding purpose, function, and capabilities of the tool) RWT users have during initial use

Incorporating these suggested modifications into future iterations of the RWT will help ensure the tool achieves the maximum impact among users and evolves to become as effective as possible in guiding research writers to develop their academic writing.

Beyond implications for improvement of the AWE tool investigated in this study, insights gathered from the examination of study participants' use of the RWT may also be useful for the design of other automated systems and adaptive CALL programs. Conceptualizing of help options that provide in-process assistance to writers using the RWT may be equally valuable to developers of other CALL technologies brainstorming the design and creation of similar support features. Additionally, because entirely individualized genre instruction is not feasible for writing instructors, understanding how a variety of learners, including native and non-native English speakers, students at different stages in their disciplinary programs, and students with diverging technological literacy levels, interact with and apply intelligent feedback holds implications for the delivery of automated feedback in other intelligent tutoring and ICALL (intelligent computer-assisted language learning) systems (Heift, 2007).

Section 7.3. Limitations

While there are a number of practical applications of this dissertation research, several limitations should also be acknowledged. The first limitation regards the lack of consistency between certain question items on the pre-task questionnaire and post-task survey. One particular focus of this study, for example, was learner perceptions of the RWT's ease of use. While the post-task survey gauged participants' perceptions of the RWT's usability, the pre-task questionnaire failed to include question items (closed- or open-ended) obtaining learner perceptions about the ease of use of other automated feedback programs or CALL applications in general. Eliciting analogous participant responses in both data collection instruments would have allowed for a fixed comparison of learners' impressions of the RWT's usability as compared to other previously used CALL programs, and discernment of whether the students' RWT interactions increased or decreased perceptions of CALL program usability.

Another shortcoming of this research concerns the constraints of the sampled population. Though all participants in this study represented the target population for formative use of the RWT (graduate students seeking to improve their research writing skills), the sample group was small, with 11 participants in total. Additionally, as observed in the report of demographic data, the study participants shared a number of similarities: all were graduate students, motivated to improve their academic writing skills, from advanced non-native English speakers to native English speaker proficiency levels, and holding some experience using technology for both professional and personal purposes. However, human–

computer interaction research recommends that studies investigating a technology's usability sample from diverse populations, encompassing different sets of users with divergent characteristics, such as users with varied background knowledge of computers or distinctive impetuses for using the technologies (Krug, 2005). To enhance the generalizability of findings and broaden implications to expanded audiences of potential target users of the AWE tool, follow-up RWT research should aim to recruit subjects of heightened diversity and in greater numbers.

A further drawback to this study relates to a lack of attention to possible relationships between learner characteristics and uses of the RWT for draft revision. Because a goal of this dissertation was simply to recognize those variables learners *perceived* as impacting their RWT interaction, there was no attempt to draw correlations among learner variables and the participants' behaviors during their RWT draft revisions. The arenas of genre learning and teaching may benefit from endeavors to uncover potential statistical correlations between learner demographics [e.g., native or non-native speaker status, discipline of study (natural or social science orientation), age, degree sought (doctoral or masters), previous technological experience, comfort level using new computer-based applications, publication experience, motivational levels to improve writing] and use of the RWT or other AWE programs for academic writing improvement.

Perhaps the most noteworthy limitation of this study regards the lack of attention to learner output. While this dissertation investigated user behaviors with and perceptions of the RWT, incremental drafts participants submitted to the tool were not analyzed. An earlier noted distinction between this research and past research was this study's focus on how students experience and interact with the AWE tool, not on the quality of the AWE feedback itself. Because the RWT feedback was still inaccurate at these beginning stages of the tool's development, the quality of the feedback was not explored in combination with the students' interactions with and impressions of the program. However, a number of researchers in applied linguistics (Attali, 2004; Burstein, Chodorow, & Leacock, 2004; Chen & Cheng, 2008; Ellis, 2004; Ellis & Calvo, 2006; Ware, 2011) stress the inextricable connections between learners' writing achievement and their AWE tool interactions in the revision process. Hyland and Hyland (2006) also hold that the investigation of students' perceived effectiveness of and interaction with the tool cannot be separated from examinations of the quality of the AWE feedback. Analyzing students' submitted drafts in addition to their perceptions of the RWT's usefulness, trust in the RWT, and interactions with the tool may have provided considerable insight into the interconnectedness and influence of these variables. Further research should explore these aspects jointly, analyzing not only language learners' perceived effectiveness of, trust in, and interactions with the RWT, but also the ways in which novice writers use the RWT feedback to address clarity of meaning in their written discourse and improve their knowledge of the research writing genre (Calvo & Ellis, 2011).

Section 7.4. Recommendations for Future Research

This dissertation stimulates a wealth of questions about the use and application of the RWT's automated feedback for formative writing development. These questions should be explored in future research to raise language learning instructors' and researchers' awareness of the ways in which the RWT and other AWE and CALL applications can be implemented to assist novice writers' acquisition of skills for recognizing and reproducing academic discourse in appropriate genre contexts (Bazerman, 1988). One subject in need of intensified investigation regards enhanced usability studies of learner–CALL technology interactions. Installing software that records interactional timestamps, which pinpoint precisely when the RWT user receives feedback or interacts with particular RWT features, would assist future researchers of student–RWT interactions in tracking when, how, and which RWT help options are used, and specifically how the automated feedback is incorporated into draft revisions. Capturing a detailed account of how RWT users access, interact with, and apply the automated feedback will also provide indispensable information to RWT developers about how the interface could be adapted to augment the tool's ease of use (Shute, 2008; Suite, 2007).

For even more in-depth RWT usability research, the integration of eye-tracking technology would help designers grasp greater understanding of user experiences with the AWE tool. Eye tracking, which records users' eye movements on a physical interface, has become a more regularly used technique in cognitive linguistics and cognitive psychology to gather data about technology users' physiological and perceptual interaction with computer-based devices. The level of depth and comprehensiveness eye-tracking techniques afford transcend what is possible when employing other data collection methods such as observation or think-aloud protocols (Cooke, 2006). Collecting detailed information about graduate writers' interaction with the RWT will alert designers to ways the RWT's ease of use could be improved (Burstein et al., 2004).

Additionally, this study sparks the need to integrate richer learner reflection data into process-oriented investigations of learner use of automated feedback for writing development. Incorporating cognitive research methodologies which aim to uncover how RWT users are processing the automated feedback during their interaction with the technology would allow greater insight into the depth of learner engagement with the RWT output. Distinguishing whether students attend to surface level features such as grammatical conventions and spelling in their drafts, what Calvo and Ellis (2011) would characterize as a component of "shallow learning," or instead, strengthen their topical knowledge on genre conventions perhaps by integrating functional language they may have observed in authentic published discourse in the Demonstration Module, what the authors would describe as "deep learning," could be exposed by researchers' implementation of expanded data collection measures. Utilization of eye-tracking methodological techniques as primary or supplemental means of data collection will illuminate learners' processing of RWT input, as eye movements are recognized as an indicator of cognitive processing activity (Goldberg & Wichansky, 2003; Just & Carpenter, 1976). Complementing the eye-tracking data with findings from analyses of learner reflective discourses may assist in further fusing connections between how writers are processing the feedback and how they are reflecting on their CALL tasks as they build and apply genre knowledge (Luo, 2005; Martin, 2009).

Though the original dissertation study proposal included a plan to conduct a comparative analysis of learners' action and reflection discourses in their RWT interactions, the scarcity of action discourse data prevented accomplishment of these systemic functional analyses. Future SFL analyses of students' reflection discourses may help researchers understand how students exploit the RWT to make meaning of the feedback or the tool itself as well as help surface learner perceptions of what they are accomplishing when they engage in the language learning activities (Schleppegrell, 2001). Analyzing reflective discourse, especially in conjunction with other cognitive processing data collection techniques such as eye-tracking or think-aloud protocols may help researchers better understand the intensity of learners' negotiations of meaning as they aim to improve meaning in their research writing.

The current study's examination of participants' perceptions of the influence of technological literacy and learner characteristics on the RWT interactions as well as learning strategies for using the RWT spurs further investigations of the role of individual learner variables in CALL program interactions. The aim of such research is not to accomplish the impossible —to create learning conditions expressly tailored to each individual learner —but rather to recognize criteria that could help in designing the most favorable computer-based learning environments to meet the needs of a variety of language learners (Heift, 2007). Constructing optimal computer-mediated learning conditions through the identification of learner personas (Heift, 2002; 2007) may also promote greater computer self-efficacy (Compeau & Higgins, 1995), heighten interactivity with the AWE tool (Cotos & Huffman, 2013; Heift, 2002), and increase learner autonomy (Chappelle, 2008) as learners' sense more possibilities to self-regulate how they learn (Blin, 2004; Figura & Jarvis, 2007).

More research considering RWT users' strategies for using the Demonstration Module may benefit the design and use of corpora for language learners' writing development. For example, observing how RWT users access the concordancer, through the "Examples" link on the Move-specific dropdown menus in the Analysis Module or through the Move/Step Examples available on the main menu at the top of every page of the RWT, would highlight how pathways to the Demonstration Module may need to be clarified, expanded, or even collapsed for more simplified access and improved user navigation. Detailed examinations of how leaners' make use of bottom-up or top-down approaches in their RWT corpus explorations and how they come to apply the findings of their corpus searches to analyze and modify their own texts may assist instructors implementing the RWT corpus or other corpora into their language instruction discern learner processes for identifying genre structures and sentence pragmatics in discourse authored by themselves and others (Biber et al., 2007; Flowerdew, 2005).

As a follow-up to an earlier cited limitation of this dissertation study, future work should examine precisely how learners apply the artificially intelligent feedback to improve their research article section drafts. When language learners interact with AWE software for formative writing development, it becomes critical to detect exactly how that automated feedback is being applied in revision stages. Closely tracing the development of writing through RWT users' incremental written drafts, as accomplished or recommend by previous researchers of AWE interaction (Cotos, 2010; Elliot & Mikulas, 2004; Lee, Gentile, & Kantor, 2010; Suite, 2007) will help safeguard against learners making only simplistic modifications of blatant surface features of the texts, and instead encourage the writers' focus on transforming their texts to improve the explicitness of meaning and enhance the texts' rhetorical quality.

Though it was beyond the scope of this study, it would be fruitful to conduct longitudinal evaluations of formative uses of the RWT for academic discourse improvement and with increased numbers of graduate students. Surveying growth or change in how learners' apply RWT feedback for draft revisions to their RA sections over the course of the semester, or even in the remaining years of their graduate programs, would generate vital information about language learners' evolving uses of and adaptions to the RWT. In-depth longitudinal studies, especially those including participants from varying demographic and computational backgrounds (Krug, 2005), will inform instructors and researchers about how intended uses of the RWT are or are not accomplished; the information will further aid practitioners in adjusting their educational practices to facilitate the most effective academic genre learning and writing development.

Addressing needs of graduate students learning to write in the research article genre requires cognizance of learner strategies as they familiarize themselves with the disciplinary writing conventions of their fields (Dudley-Evans, 2000; Swales, 1990). Automated writing evaluations programs, offering cost-effective alternatives for institutions considering educational material purchase, alleviating teacher burden during in-process drafting stages, and generating timely formative feedback to language learners, promise to be an integral part of the next wave of genre learning in higher education (Oliver, 2001). Yet to facilitate the most effectual integration of the AWE programs, writing instructors assimilating the new technologies into their writing instruction must first identify student readiness for use of the computer-based systems; identifying learners' personal characteristics, technological backgrounds, including abilities and struggles, and learning styles and preferences will lend valuable information to not only writing instructors, but also writing program developers wishing to utilize the RWT and other AWE applications in their language learning classrooms. Empirical investigations like the current dissertation study are crucial to understanding successful pedagogical applications of the computer-mediated language learning technologies, as well as the ways in which AWE software can be designed or adapted to foster individualized learning experiences (Heift, 2007) and achieve greater learner fit (Chapelle , 2001) among the users of the automated systems. Targeting research on the collection and analysis of in-depth data about learners, learner perceptions of an automated tool and the tool's feedback, and learner strategies for developing genre knowledge with the CALL program will further enrich the existing body of knowledge on genre learning and establish how AWE programs like the RWT can be developed to better facilitate novice writers' mastery of the research article genre.

APPENDIX A: PRE-TASK QUESTIONNAIRE

Adapted from Oliver and Towers (2000), Rimrott and Heift (2005), and Shi, Reeder, Slater and Kristjansson (2004)

A. Please answer the following questions gathering demographic information about you.

What are your initials? __________

What is your age range?

21-25 [ ]   26-30 [ ]   31-35 [ ]   36-40 [ ]   41 + [ ]

What is your gender?

Female [ ]   Male [ ]   Transgender [ ]

What is your discipline of study? ________________________

What is your native language? __________________________

If your native language is not English, how many years have you studied English?

____

How many papers have you had published in English? _______________

B. How often do you perform the following tasks? (Please mark the most appropriate answer)

	Never	**Rarely**	**Often**	**Always**
use a computer	[ ]	[ ]	[ ]	[ ]
install a program onto a computer	[ ]	[ ]	[ ]	[ ]
create a Word document	[ ]	[ ]	[ ]	[ ]
conduct research using the computer	[ ]	[ ]	[ ]	[ ]
manipulate graphics/pictures on the computer	[ ]	[ ]	[ ]	[ ]
use tables, styles or templates with word processing	[ ]	[ ]	[ ]	[ ]
use PowerPoint	[ ]	[ ]	[ ]	[ ]
create websites	[ ]	[ ]	[ ]	[ ]
use a computer language (e.g., html, php, java)	[ ]	[ ]	[ ]	[ ]
use social media (e.g., Facebook, Twitter)	[ ]	[ ]	[ ]	[ ]
use computer-based language learning resources	[ ]	[ ]	[ ]	[ ]
use automated writing evaluation tools (e.g., Criterion)	[ ]	[ ]	[ ]	[ ]

C. How often do you use a computer for the purposes listed below? (Please mark the most appropriate answer)

	Never	Rarely	Often	Always
in your job/studies	[ ]	[ ]	[ ]	[ ]
for hobby or leisure activities (e.g., playing games, downloading music)	[ ]	[ ]	[ ]	[ ]
for financial purposes (e.g., banking, shopping)	[ ]	[ ]	[ ]	[ ]
for educational purposes (e.g., assignments)	[ ]	[ ]	[ ]	[ ]
as an information source (e.g., to find information/research)	[ ]	[ ]	[ ]	[ ]
for communication with friends or family	[ ]	[ ]	[ ]	[ ]

D. How comfortable are you performing the following tasks:

	Very uncomfortable	Uncomfortable	Comfortable	Very comfortable
working in your job/studies	[ ]	[ ]	[ ]	[ ]
writing in academic English	[ ]	[ ]	[ ]	[ ]
writing up empirical research in English	[ ]	[ ]	[ ]	[ ]
recognizing moves/steps in Introduction sections in your field	[ ]	[ ]	[ ]	[ ]
applying moves/steps to write Introduction sections in your field	[ ]	[ ]	[ ]	[ ]
learning with new technology	[ ]	[ ]	[ ]	[ ]
using computer-based language learning tools	[ ]	[ ]	[ ]	[ ]
solving problems you encounter when using the computer	[ ]	[ ]	[ ]	[ ]

E. Please mark one of the following items.

In what context do you prefer to work?

alone   with a partner   with a group   Other __________

When learning a new technology, in what contexts do you prefer to work?

alone   with a partner   with a group   Other__________

To what degree do you trust automated writing evaluation systems?

Complete distrust   Some trust   Much trust   Complete trust

F. What do you expect to gain using the Research Writing Tutor?

APPENDIX B: POST-TASK SURVEY

Adapted from ISO 9241 (2006) usability and effectiveness standards

What are your initials? ________________

PART A: To what extent do you agree with the following statements? (Please circle one)

I found the website easy to use.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

I understood the feedback.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

The feedback provided by the RWT met my expectations.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

My overall experience with the RWT met my expectations.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

The RWT restricted the degree of control I had during my interaction.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

I had the ability to accept or reject the revisions recommended by the RWT.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

The RWT helped me develop skills for writing research articles.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

I think the RWT tool is useful for improving research article writing skills.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

I would like to use the Research Writing Tutor again.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

I trust the Research Writing Tutor.

Strongly Disagree	Disagree	Agree	Strongly Agree
1	2	3	4

PART B: Please complete the following short answer questions about use of the RWT.

What strategies did you use when interacting with an AWE tool?
How do you think your background experience with computer-based tools affected your interaction with the RWT?

What other individual characteristics might have affected your experience with the RWT, and why?

What particular features of the RWT do you find beneficial, and why?

How could the RWT be improved to increase its usefulness to students?

APPENDIX C: INTER-TRANSCRIBER SIMPLE PERCENTAGE AGREEMENT CALCULATIONS BY PARTICIPANT

(* indicates the participant is a NNS)

Participant ID	Total transcribed units in sample	Total units of agreement	Simple percentage agreement
1*	301	295	0.980066445
2*	187	182.5	0.975935829
3	401	397.5	0.99127182
4*	340	338.5	0.995588235
5*	422	399	0.94549763
6	483	477	0.98757764
7	357	350	0.980392157
8	357	352	0.985994398
9*	191	179	0.937172775
10*	273	267	0.978021978
11*	140	126.5	0.903571429
Instructor*	386	382.5	0.9909032642

APPENDIX D: SEQUENCE STRANDS OF LEARNER INTERACTIVITY WITH RWT

Full Sequence of RWT Interaction Activities by Participant

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11
C	A	A	D	C	C	A	C	A	B	C
B	D	B	A	A	A	C	A	D	D	A
D	F	D	D	D	C	B	D	C	C	D
C	A	C	B	B	G	C	A	A	J	A
B	D	G	D	I	B	G	C	C	E	B
D	B	C	B	B	C	C	G	G	F	C
K	A	E	C	I	G	B	C	C	A	B
G	C	F	G	B	E	D	G	G	D	D
K	G	C	C	H	F	G	C	B	C	C
G	A	G	G	B	D	B	G	C	G	J
C	F	C	C	I	G	H	A	G	C	C
K	A	G	B	C	C	C	D	B	G	D
C	C	C	L	E	G	G	B	C	C	C
G	D	G	B	F	C	E	E	G	G	G
B	A	C	C	C	G	F	F	B	J	C
E	B	G	D	B	C	D	A	C	B	G
H	H	B	H	I	B	B	D	B	H	J
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